

ONTARIO
COLLEGE OF PHARMACY
44 GERRARD ST. E.
TORONTO,

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TORONTO,

THE BRITISH PHARMACEUTICAL CONFERENCE.

AN ORGANIZATION FOR THE ENCOURAGEMENT OF PHARMACEUTICAL RESEARCH AND THE PROMOTION OF FRIENDLY INTERCOURSE AMONGST PHARMACISTS.

This Association of Chemists and Druggists and others interested in Pharmacy is managed by about twenty unpaid officers annually elected by the members.

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1863, NEWCASTLE. 1864, BATH. 1865, BIRMINGHAM. 1866, NOTTINGHAM. 1867, DUNDEE. 1868, NORWICH. 1869, EXETER. 1870, LIVERPOOL. 1871, EDINBURGH. 1872, BRIGHTON. 1873, BRADFORD. 1874, LONDON. 1875, BRISTOL. 1876, GLASGOW.

The chief business of the meetings is the communication of written descriptions of original investigations made by members during the year, and includes discussions on such papers by the assembled members and visitors.

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The Conference annually presents to members a handsome octavo volume of 500 or 600 pages, containing the proceedings at the yearly meeting and a report on the progress of pharmacy, or Year-Book, comprising abstracts of papers on pharmacy, materia medica, and chemistry, and on new preparations, processes, and formulae, published at home and abroad during each year. The funds of the Conference, composed of annual subscriptions of seven shillings and sixpence, are devoted to the production of this useful book, no pains being spared to make it the desk companion of the year, and an invaluable permanent work of reference for chemists and druggists and others interested in pharmacy. The Executive Committee of the Conference trusts that members will show the current Year-Book to their friends and acquaintances—principals, assistants, or pupils—and obtain as large a number of new members as possible. Alphabetical lists of (1) the names and addresses of subscribers, and (2) of the towns in which they reside, will be found in each Year-Book.

NOMINATION FOR MEMBERSHIP.

Gentlemen desiring to join the Conference can be nominated at any time on applying to either of the officers or members. No special form of nomination is required. The Name and Address of each candidate to be written legibly, and forwarded to the Hon. Secretary, Professor ATTFIELD, 17, Bloomsbury Square, London, W.C., who will sign the paper, if a member's name is not already appended. The subscription may be sent at the same time.

THE ANNUAL SUBSCRIPTION.

The Annual Subscription is Seven Shillings and Sixpence, payable in advance. For this sum each member is entitled to one copy of the Year-Book, carriage free; and to attend the Annual Meetings.

(Members residing abroad can be supplied with the Year-Book by pre-paying the annual subscription, and the postage to the respective countries, of a book weighing two imperial pounds. The subscription, including postage, for either Australia, Belgium, Canada, Cape of Good Hope, France, Germany, Gibraltar, Holland, Natal, New Zealand, United States of America, or the West Indies, is Ten Shillings.)

Remittances may be by Post Office Order, made payable to JOHN ATTFIELD, at "High Holborn," or by stamps or cheque. The Conference year commences on July 1st, and Annual Subscriptions are due in advance on that date. They may be sent then or soon afterwards to the London Secretary.

The Year-Book is posted as soon as published (in December) to every member who has previously paid his subscription. To members joining later the volume is posted immediately on receipt of a Money Order or other form of remittance. Members may still obtain, by post, any number of copies of the "1870" Year-Book (the first issued), or that for 1871 or 1872 on remitting 5s. 6d. per copy—foreign members, 7s. 6d. The price of extra copies of the volume for 1873, or subsequent issues, will be 7s. 6d., post free,—foreign members, 10s. Price of the Year-Book to non-members, exclusive of postage, 10s.

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THE BRITISH INDIAN CONFERENCE
 1890-1891
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The British Indian Conference was held at the Hotel Cecil, London, on the 10th, 11th, and 12th of September, 1890. The Conference was attended by representatives of the Indian community in Britain, and by members of the Indian community in India. The Conference was presided over by Mr. J. H. P. [Name], and was held in the presence of Mr. [Name]. The Conference was held in the Hotel Cecil, London, on the 10th, 11th, and 12th of September, 1890. The Conference was attended by representatives of the Indian community in Britain, and by members of the Indian community in India. The Conference was presided over by Mr. J. H. P. [Name], and was held in the presence of Mr. [Name].

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YEAR-BOOK OF PHARMACY

COMPRISING

ABSTRACTS OF PAPERS

RELATING TO

PHARMACY, MATERIA MEDICA, AND CHEMISTRY

CONTRIBUTED TO BRITISH AND FOREIGN JOURNALS,

FROM JULY 1, 1874, TO JUNE 30,

1875.

ONTARIO
COLLEGE OF PHARMACY
44 GERRARD ST. E.
TORONTO,

WITH THE

TRANSACTIONS

OF THE

BRITISH PHARMACEUTICAL CONFERENCE

AT THE

TWELFTH ANNUAL MEETING

HELD IN

BRISTOL,

AUGUST, 1875.

LONDON:

J. & A. CHURCHILL, 11, NEW BURLINGTON STREET.

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YEAR-BOOK OF PHARMACY

ABSTRACTS OF PAPERS

RELATIVE TO

PHARMACY, MATERIA MEDICA, AND CHEMISTRY

CONTRIBUTED TO BRITISH AND FOREIGN JOURNALS

British Pharmaceutical Conference.

YEAR-BOOK OF PHARMACY.

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THE most important ways in which a member can aid the objects of the Conference are by suggesting subjects for investigation, working upon subjects suggested by himself or by others, contributing information tending to throw light on questions relating to adulterations and impurities, or collecting and forwarding specimens whose examination would afford similar information. Personal attendance at the yearly gatherings, or the mere payment of the annual subscription, will also greatly strengthen the hands of the executive.

A list of subjects suggested for research, is sent to members early in the year. Resulting papers are read at the annual meeting of the members; but new facts that are discovered during an investigation may be at once published by an author at a meeting of a scientific society, or in a scientific journal, or in any other way he may desire; in that case, he is expected to send a short report on the subject to the Conference.

The annual meetings are usually held in the provinces, at the time and place of the visit of the British Association; that for 1876 will be held in Glasgow.

Gentlemen desiring to join the Conference, can be nominated at any time on applying to either of the secretaries or any other officer or member. The yearly subscription is seven shillings and sixpence, payable in advance, on July 1st. Further information may be obtained from the secretaries—

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THE YEAR-BOOK OF PHARMACY.

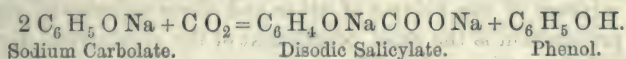
The Conference annually presents to members a volume of 500 to 600 pages, containing the proceedings at the yearly meeting, and an Annual Report on the Progress of Pharmacy, or Year-Book, which includes notices of all pharmaceutical papers, new processes, preparations, and formulæ published throughout the world. The necessary funds for accomplishing this object consist solely of the subscriptions of members. The Executive Committee, therefore, call on every pharmacist—principal, assistant, or pupil—to offer his name for election, and on every member to make an effort to obtain more members. The price of the Year-Book to non-members is ten shillings. The constitution and rules of the Conference, and a convenient form of nomination, will be found at page 407.

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INTRODUCTION.

THE scientific literature of the past year affords evidence of a healthy activity both at home and abroad in the various departments connected with Pharmacy. Among the more important achievements recorded in the following pages, none perhaps has attracted more general attention than the discovery of the antiseptic properties of salicylic acid, coupled as it was with the invention of an economic process for the preparation of this substance. As early as 1860, Prof. Kolbe in conjunction with Dr. L  utemann made the interesting observation that this acid, which had previously been obtained from the volatile oils of *Spir  a Ulmaria* and *Gaultheria procumbens*, could be artificially prepared by the action of carbonic anhydride on heated phenol in which pieces of sodium were being dissolved. Prof. Kolbe now shows that this process can be simplified and rendered more economical by the substitution of caustic soda for metallic sodium. Phenol is carefully saturated with the calculated quantity of caustic soda, and the dry carbolate obtained by evaporation exposed in a retort to the action of dry carbonic acid gas while its temperature is gradually raised from 100   to 220   C. Only one half of the carbolic acid existing in the sodium carbolate takes part in the formation of salicylate, the other half distilling over in the free state.



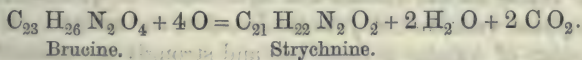
The basic salicylate remaining in the retort is dissolved in water, and the salicylic acid precipitated from this solution by the addition of hydrochloric acid. The crude acid thus obtained may be readily purified, as Dr. A. Rantert has recently shown, by distilling it in a current of superheated steam at a temperature of 170   C. Prof. Kolbe's statements as to the antiseptic and anti-fermentative properties of salicylic acid are corroborated by the experiments of Prof. Neubauer, Prof. Thiersch, Dr. Godeffroy, Mr. Benger, and others, the results of which go to show the extensive practical uses to which this inodorous and non-poisonous substance may be applied. A less favourable account of its properties is given by Prof. Salkowsky, who states that it only retards but does not

entirely prevent putrefaction, that it possesses no deodorizing properties, and that it is inferior as an antiseptic to benzoic acid. Be this as it may, there is sufficient evidence to show that salicylic acid may be justly regarded as an important acquisition to pharmacy, medicine, and various branches of industry, and that it is likely to maintain its position. The influence of borax on fermentation and putrefaction forms the subject of an interesting paper by Mr. J. B. Schnetzler.

Much care and time have been devoted to the study of the active principles of *Digitalis purpurea*. The acknowledged difficulty attending the preparation of Nativelle's crystallized digitalin has induced its discoverer to communicate to the Academy of Medicine and the Society of Pharmacy in Paris, the details of a modified process by which this substance can be obtained economically and in a very pure condition. The modification consists mainly in the separation of digitalin from digitin by means of chloroform, and afterwards removing the yellow oily substance, which accompanies the digitalin and retards its crystallization, by treatment with ether. M. Kosmann declines to regard the crystallized digitalin of MM. Homolle and Nativelle as the active principle of foxglove, but considers it as a product of change, occupying an intermediate position between insoluble digitalin and his (Kosmann's) digitaliretin. In his opinion the soluble digitalin is the principle primarily elaborated by the plant, whereas insoluble digitalin, Nativelle's crystallized digitalin and digitaliretin are products of decomposition. Prof. Schmiedeberg applies the name *digitalin* to a well defined substance which he has extracted from commercial digitalin by a mixture of one volume of ether and three volumes of alcohol. This preparation is the chief constituent of the commercial digitalin obtained from the seeds, and possesses in a high degree the action of foxglove on the heart; it forms soft colourless small grains, the composition of which is represented by the formula $C_5 H_8 O_2$, and can be readily split up into glucose and digitaliresin. It is accompanied in commercial digitalin by two other principles, which are also believed to pre-exist in the seed, viz., *digitalein* and *digitonin*, the latter of which yields by decomposition glucose and the following derivatives:—Digitoresin, digitonein, digitogenin, and paradigitogenin. *Digitoxin*, $C_{31} H_{33} O_7$, a well defined crystallizable principle isolated from foxglove leaves by Prof. Schmiedeberg, is described by its discoverer as so highly poisonous a substance as to be hardly fit for medicinal use. Mixed with paradigitogenin it is said to form the principal constituent of Nativelle's crystallized

digitalin. In the light of what has already been accomplished, and in view of the much larger amount of work which still remains to be done in connection with this subject, it would appear that the chemistry of digitalis promises to be as wide and as inexhaustible a field as that of opium, aconite, or the cinchonas.

Chemists cannot fail to be much interested in the important discovery made by Prof. F. L. Sonnenschein, that brucine can be converted into strychnine by the action of dilute nitric acid. The process appears to be one of simple oxidation, as it can also be effected by potassium chromate and other oxidizing agents.



The intimate relation between the two strychnos bases is further elucidated by the observation that strychnine, when heated for some time with an aqueous solution of baryta, or a caustic alkali, in a sealed glass tube, placed in a water bath, yields a substance which resembles brucine in its behaviour to nitric acid and other reagents. Prof. Sonnenschein's experiments in this direction are not yet concluded.

Prof. F. A. Flückiger and Dr. E. Buri give an account of their chemical investigation of *kosin*, a pure principle isolated from koso (cusso) flowers, and presented to them by Dr. E. Merck, of Darmstadt. This substance, which occurs in variable quantities in Dr. Bedall's *koussin*, forms needles or short prisms, having a pale yellow colour, and a very high specific gravity. Its composition is represented by the formula $\text{C}_{31} \text{H}_{38} \text{O}_{10}$. The authors intend to resume and complete their researches, which at present lead to the conclusion that *kosin* is an ether of isobutyric acid. Though unquestionably a pure principle in a chemical sense of the term, it can hardly be looked upon as the active principle of cusso, for experiments conducted by Prof. Buchheim show that its anthelmintic action is much inferior to that of Dr. Bedall's *koussin*, thus proving that if the medicinal effect of *koussin* is to be attributed to the presence of *kosin*, the action must be due to the form and condition in which the latter exists in *koussin*.

The readers of the *Year-Book* will be glad to see that Dr. C. R. A. Wright continues to bring his energy and talent to bear on the investigation of substances interesting to pharmacists, and to find in its columns a record of the valuable researches on the opium alkaloids and their derivatives, and on Japanese oil of peppermint, carried out by him jointly with Mr. G. H. Beckett. Dr. Wright's

further examination of Mr. Groves' aconite bases proves that "pseud-aconitine" is not isomeric, either with "aconitine" or the "bitter inert base" described by Mr. Groves last year; and that the last named substance is not identical with Mr. Broughton's "atisin," the active principle of *Aconitum heterophyllum*. The great tendency of the aconite bases to undergo changes during their extraction and purification renders their chemical study an extremely difficult task.

Several other investigators have given their attention to the vegetable alkaloids. The combinations of these substances with iodine form the subject of an elaborate paper by Mr. H. R. Bauer, containing a full report on the iodides and hydriodates of quinine, cinchonine, morphine, veratrine, strychnine, brucine, and coniine. Neutral hydrobromate of quinine is described and strongly recommended by M. Boille, who claims for it a decided superiority, from a medicinal point of view, over the sulphate and other quinine compounds, on account of its great solubility in water and its richness in quinine. The salicylate and carbolate of quinine are reported upon by Mr. J. Jobst, who obtained both salts in a definite crystalline form. Dr. H. Weppen finds that Schneider's test for alkaloids (see *Year-Book of Pharmacy*, 1874, 212) may also be applied to veratrine, with which it forms a characteristic blue tint, distinctly observable with as small a quantity as one milligram of veratrine, and not produced by any other alkaloid. The addition of solution of chlorine to a sulphuric or hydrochloric solution of berberine is stated by M. Klunge to produce a red or pink coloration, still discernible with a solution containing $\frac{1}{250000}$ of the alkaloid. MM. Boiraux and Seger find that the oils obtained by the destructive distillation of coal are good solvents of a great number of alkaloids, and can be profitably employed in their manufacture. These oils possess the advantage over alcohol of having but little action upon the extractive, and yielding nearly colourless solutions, thus rendering repeated recrystallization and treatment with charcoal unnecessary.

Some further researches have been published in connection with aloes and the aloins. Dr. W. Craig asserts that the so-called resin of aloes, when thoroughly exhausted of aloin, is a perfectly inert and harmless substance, while aloin is an active aperient, and probably the only active principle of aloes; also that aloin may, by exposure to air, undergo considerable chemical change without losing its medicinal properties. Dr. Rochleder's supposition that the aloins of Barbadoes aloes, Natal aloes, and Socotrine aloes form the members of a homologous series, is contradicted by Dr. Tilden, who, in an important communication to the British Pharmaceutical Conference,

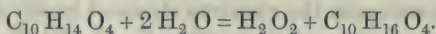
arrives at the conclusion that barbaloin and zanaloin are isomeric (in the anhydrous state), that socaloin is identical with zanaloin, and that nataloin is widely separated from the rest of these crystalline principles, as it yields neither chrysammic acid nor definite chloro- or bromo- substitution compounds. For barbaloin and zanaloin in the anhydrous state Dr. Tilden proposes the formula $C_{16}H_{18}O_7$, which agrees well with the numbers obtained in the analyses of the bromo-, chloro-, and acetyl- derivatives, $C_{16}H_{15}Br_3O_7$, $C_{16}H_{15}Cl_3O_7$, and $C_{16}H_{15}(C_2H_3O)_3O_7$.

Messrs. A. Faust and J. Homeyer have resumed their chemical examination of eucalyptol, the principle constituent of the volatile oil of *Eucalyptus globulus*. They find that this oil contains a terpene boiling at 150° to 151° , another terpene having a higher boiling point (172° – 175°), cymol (cymene), and a substance containing oxygen, closely allied to cymol. Cymol and the terpene boiling at 172° to 175° form the principal constituents, amounting to about nine tenths of the oil. The same chemists report the results of their analyses of *cynene*, a body obtained by Mr. Völkel, and afterwards by Mr. Graebe, by the action of either phosphoric anhydride or phosphorus sulphide on oil of wormseed. They show that this substance, to which Messrs. Kraut and Wahlforss had assigned the formula $C_{10}H_{16}$, is identical with cymol (cymene) $C_{10}H_{14}$, and confirm this statement by analyses of the corresponding sulpho-acid and its barium salt.

The essential oil of cherry-laurel has always been supposed to be identical with the oil of bitter almonds, but does not appear ever to have been submitted to a systematic examination. Dr. Tilden supplies experimental proof that the main constituent of this oil is benzoic aldehyde, accompanied by a variable amount of hydrocyanic acid, about one per cent. of a volatile oil (possibly benzoic alcohol), and traces of an odorous resin. Like the oil of bitter almonds, this oil does not seem to exist ready formed, but to be produced by the action of water, though little is known of the principles which are concerned in this instantaneous reaction. The so-called amorphous amygdalin of cherry-laurel leaves is much slower in its action upon an emulsion of sweet almonds than crystallized amygdalin, from which, moreover, as M. E. Lehmann has recently shown, it differs so much both physically and chemically that it cannot be said to deserve its name.

In a valuable paper read at the Bristol meeting of the Conference, Mr. C. T. Kingzett calls attention to the researches on the limited oxidation of essential oils. His own observations prove that no

ozone is produced by the atmospheric oxidation of turpentine, and that peroxide of hydrogen does not result as a direct product; but that an organic peroxide is formed, which, on treatment with water, yields peroxide of hydrogen. The production of H_2O_2 , and the simultaneous formation of camphoric acid is explained as the result of the action of water on camphoric peroxide.



Peroxide of hydrogen appears to be thus produced by all terpenes represented by the formula $\text{C}_{10}\text{H}_{16}$, and also by cymene from all sources, but not by the terpenes of the formula $\text{C}_{15}\text{H}_{24}$. Mr. Kingzett regards this as a further proof that cymene constitutes the nucleus form of matter in the terpenes of the formula $\text{C}_{10}\text{H}_{16}$, and thinks that in those of the formula $\text{C}_{15}\text{H}_{24}$ the carbon exists in an allotropic condition. The terpenes represented by the formula $\text{C}_{20}\text{H}_{32}$ he has not yet examined. The formation of hydric peroxide from cymene throws further light upon the connection between the terpenes and the benzene series, and affords an excellent means of distinguishing the terpenes which contain the cymene nucleus from those which do not.

The therapeutic application of monobromated camphor by Dr. Bourneville has induced M. Gault to work out an improved process for its preparation, the details of which will be found on page 53 of this volume. Dr. Valenti y Vivo reports on the antagonism between this substance and strychnine, and suggests that it may be used with advantage as an antidote to that poison, in quantities varying from four to six grains, given in small doses.

Dr. Liebreich's theory, that chloral hydrate in passing through the organism splits up into chloroform and a formate under the influence of the alkali of the blood, appears to be losing ground. MM. V. Mering and Musculus show that the breath of chloralized animals gives no indication of chloroform, and that the urine of persons taking five grams of chloral hydrate per night for some time, contains neither chloroform nor formic acid, but always a trace of undecomposed chloral. They also find that such urine contains a peculiar crystallizable acid, which reduces Fehling's solution, and turns the plane of polarization to the left. The analysis of this substance, to which the provisional name "uro-chloralic acid" is given, leads to the formula $\text{C}_7\text{H}_{12}\text{Cl}_2\text{O}_6$. M. Tanret finds that though chloral is split up by an alkali into chloroform and a formate, it suffers a very different decomposition when treated with an alkali in the presence of a powerful oxidizing agent such as

potassium permanganate, the action resulting in that case in the formation of carbonic oxide and the chloride, carbonate, and formate of the alkali. He believes that the same change occurs in the blood under the influence of the alkali and the oxygen of the oxyhæmoglobin, and that the hypnotic effect of chloral is due to the carbonic oxide evolved. Some further information respecting the preparation and the chemical, physiological, and therapeutic properties of croton chloral is supplied by Dr. R. Engel.

The presence of copper in the human organism has been repeatedly maintained and disputed, and is now reasserted by MM. Bergeron and Hôte, who have conducted their experiments with such care and precaution as to leave no reasonable doubt of the normal occurrence of traces of this metal in the secretory organs, a point of no small importance to those engaged in forensic investigations.

The chemical constitution of chlorinated lime still continues to engage the attention of scientific chemists. Mr. W. Wolters endeavours to throw light upon this subject by distilling bleaching powder with an acid, by distilling it alone, and by determining the amount of chlorine and hypochlorous acid by shaking with mercury after treatment with carbonic acid. Mr. Kingzett shows that crystals of calcium hypochlorite, a substance never before isolated, can be readily obtained by exposing a concentrated solution of chlorinated lime to a freezing mixture, or by evaporating the solution in vacuo over sulphuric acid and potash. As the assumption that bleaching powder is a mixture of hypochlorite and chloride of calcium is not supported by other considerations, he expresses himself in favour of Prof. Odling's formula, $\text{Ca} \begin{Bmatrix} \text{Cl} \\ \text{O Cl} \end{Bmatrix}$, and argues that this combination is so feeble that it is destroyed by water.

In an interesting contribution to the meeting of the British Pharmaceutical Conference, entitled "Pharmaceutical Experiments on the Bristol Rocks," Mr. Stoddart mentions the remarkable fact that he has succeeded in separating silver from a carboniferous limestone, a formation in which it has never been found before. It occurs with ferric oxide in the proportion of 97 to 300 grains per ton, and is not accompanied by either lead, quartz, or sulphur. Minute quantities of gold are found with the silver.

Mr. Umney criticizes the B.P. process for the preparation of citrate of lithium, and proves by an examination of a number of trade specimens, that manufacturers do not supply the anhydrous citrate required by the Pharmacopœia, but send out preparations

containing not more than 73 to 84 per cent. of that substance. In place of the anhydrous preparation he recommends the crystals, $L_3 C_6 H_5 O_7 \cdot 4 H_2 O$, as thoroughly definite and reliable, or the monohydrated salt, $L_3 C_6 H_5 O_7 H_2 O$, obtained by drying the crystals at $100^\circ C$. A report on the purity of commercial carbonates of magnesium by Mr. J. C. Thresh shows that the heavy carbonates are as a rule satisfactory, but that appreciable quantities of iron, lime, and soluble salts occur in the light carbonates.

Analytical Chemistry never fails to supply new and valuable information on subjects more or less intimately connected with pharmacy, and has again proved very productive in this respect during the past year. M. Personne publishes a volumetric process for the estimation of potassium iodide, which is based upon the fact that mercuric chloride does not form a permanent precipitate with a solution of KI until one half of the latter has been used up in the formation of a soluble double salt. Copper is estimated by M. Lagrange by converting it into the double tartate of copper and sodium, and titrating with a standard solution of glucose. M. C. Fahlberg shows that zinc may be determined in the presence of manganese and aluminium by precipitating it from a solution in hydrochloric acid by means of a standard solution of potassium ferrocyanide, a uranium salt being used as an indicator. Mr. J. Macagno estimates phosphoric acid by dissolving the phosphomolybdic precipitate in an alkali, acidifying with HCl or H_2SO_4 , reducing the molybdic acid to sesquioxide by metallic zinc, and reoxidizing the sesquioxide by means of a standard solution of potassium permanganate. Prof. H. H. Croft confirms an observation made by Mr. L. Dolme, that dilute phosphoric acid containing pyrophosphoric acid forms a white precipitate with ferric chloride, and adds, that metaphosphoric acid has a similar action. A solution of glacial phosphoric acid in cold water forms white precipitates with ferric chloride and albumen; when heated for a short time, it loses the power of precipitating albumen, but continues to act on the ferric salt; when boiled for a long time, it ceases to precipitate either. Hence ferric chloride may be advantageously employed for distinguishing the phosphoric acids. Messrs. Russell and West describe a method for the determination of urea based on the observation that, when treated with sodium hypobromite and sodium hydrate under like conditions of temperature and pressure, a given quantity of urea always yields the same volume of nitrogen. With the improvements in the apparatus suggested by Mr. R. Apjohn, the process is a thoroughly practical one, well deserving the attention

of medical men and pharmacists. Among other analytical contributions possessing pharmaceutical interest which have found a place in this volume, the following may here be mentioned. The reactions of chlorinated alkalies with morphine and other proximate principles, by Mr. H. S. Wellcome; hæmatoxylin as an acidimetric indicator, by Mr. O. Maschke; the analysis of sugar, by Dr. J. M. Milne; the detection of arsenic in organic and inorganic matter by MM. Mayençon and Bergeret; the determination and assay of sulphuric acid, by M. A. G. Pouchet; the detection of arsenic in sublimed sulphur, by Dr. H. Hager; the determination of boracic acid, by M. A. Ditte; the detection and estimation of nitrous acid in potable waters, by MM. Gratana and Plugge; the reactions of codeine, by Mr. K. Calmberg; the determination of chlorine and the alkalies in vegetable and animal substances by Mr. H. B. von Adlerskron; the separation and estimation of metals by means of hydrogen, by Mr. W. Müller; the determination of tannin, by MM. Muntz and Ramspacher; the determination of acetates and of acetic acid in presence of mineral acids, by M. C. Witz; and the estimation of nitric acid by indigo, by Mr. F. Fischer.

Among the new remedies of the year the first place is unquestionably due to *jaborandi*. This Brazilian drug was brought under the notice of the profession as a very powerful diaphoretic and sialogogue by Dr. S. Coutinho, of Pernambuco, who induced Prof. Gubler to test its efficacy at the Hospital Beaujon, Paris. Experiments in the same direction have since been carried out by Dr. Ringer and others in this country, and the results of all confirm Dr. Coutinho's account of this marvellous medicine to the fullest extent. Prof. Baillon's supposition that *jaborandi* belongs to the natural order *Rutaceæ* and probably to the genus *Pilocarpus*, is proved to be correct by Mr. Holmes, who has examined fruit-bearing specimens of the plant, a description of which, accompanied by an illustration, is reprinted in this volume from the *Pharmaceutical Society's Journal*. But though the genus is thus definitely ascertained, the species to which this drug belongs must remain a matter of uncertainty until flowering specimens of the plant can be obtained. M. Planchon also gives a minute description of the plant, and states that experiments he has recently made lead him to the conclusion that the stem bark possesses the same medicinal properties as the leaves.

The physiological and botanical study of *jaborandi* has been promptly followed by its chemical investigation. M. Byasson claims to have isolated its active principle, which he describes as a liquid,

viscid, aromatic alkaloid, having an acrid bitter taste, and capable like nicotine of being carried over with water by distillation. This somewhat ill-defined substance he proposes to call "jaborandine," thus leaving out of sight the prior appropriation of this name to an alkaloid extracted by M. Parodi from a jaborandi of piperaceous origin used by the natives of Paraguay. Mr. A. W. Gerrard has succeeded in separating from the leaves and bark of true jaborandi a pale soft amorphous alkaloidal principle, possessing the physiological characteristics of the drug, having marked chemical reactions, and yielding crystalline compounds with nitric and hydrochloric acids. This substance, to which, in accordance with Mr. Holmes' suggestion, he gives the name "pilocarpine," appears to be identical with a principle subsequently isolated from jaborandi by Mr. E. Hardy; its thorough chemical investigation, however, is deferred until a larger quantity of it has been produced. In addition to pilocarpine, the presence in jaborandi of an aromatic essential oil solid at ordinary temperature, tannin, a peculiar volatile acid, chloride of potassium, and the probable presence of a second alkaloid forming acid salts, may be inferred from Mr. Gerrard's investigation.

Boldo, the leaves of a monimiaceous tree growing in the Chilian Andes, has attracted the attention of the medical profession on account of its reputed value as a stomachic tonic and as a remedy for liver complaints. From an elaborate report on the botany, chemistry, and pharmacy of this drug, by M. Claude Verne, an abstract of which will be found on page 200 of this volume, its action appears to be mainly due to its aromatic constituents and an essential oil. Though the latter amounts to no less than two per cent. in the fresh herb of the American plant, attempts to produce it from plants grown in Paris have yielded but a mere trace. The existence in boldo of small quantities of an alkaloid (boldine) has been shown by MM. Verne and Bourgoin in a previous report (see *Year-Book of Pharm.*, 1873, p. 97).

Gurjun oil, *gurjun balsam*, or *wood oil*, the oleo-resin from several species of *Dipterocarpus*, which was hitherto known merely as a substitute for and an adulterant of copaiba, promises to rise to a high rank in the list of recognized medicines. Dr. Dougall, of the Indian Medical Service, speaks of it as an invaluable remedy for leprosy; and Prof. Erasmus Wilson bears testimony to its value in cases of painful eczema, lupus, cancer, and skin diseases of various kinds. Mixed with lime water it is applied in the form of a liniment, and in cases of leprosy it is administered in

this form both externally and internally. So favourable are the reports of its action, that the Indian Government has called particular attention to this mode of treating leprosy, inviting the co-operation of the local administrations towards the extension of its use, with the request that reports on the results be submitted at the end of the year.

Yet another important remedy for skin diseases has been brought under the notice of the profession. Dr. Fayrer, of Calcutta, states in a communication to the *Medical Times and Gazette*, that he has found no remedy so rapidly effective and so reliable in the treatment of herpes circinnatus, chloasma, and intertrigo, as a secret preparation sold at Calcutta and Bombay under the name of *Goa* powder, and used in the form of an ointment. He also speaks of a similar preparation known as *Bahia* powder as equally efficacious. Dr. J. F. da Silva Lima endeavours to prove the identity of both *Goa* and *Bahia* powder with *araroba* powder, a popular remedy employed for many years in several provinces of the Brazilian empire for the cure of various cutaneous affections, by tracing the three preparations to the same botanical source, a leguminous plant growing in Bahia. Mr. D. S. Kemp, of Bombay, believes it to be the pith, and suggests for it the new name "chrysarobine," indicating its yellow colour. How happily this name has been chosen will be seen from the results of an analysis of *araroba* recently made by Prof. Attfield, which prove it to consist mainly of crysophanic acid, with small quantities of a glucoside, a bitter principle, gum, resinous bodies, woody fibre, and mineral matter. Making use of Dr. Attfield's results, Mr. Holmes supplies some further evidence of the identity of *Goa* powder and *araroba* by proving the presence of crysophanic acid in both preparations.

Several other new remedies have been described. Dr. C. Symes gives a description of *Carnauba* root, the root of *Corypha cerifera*, which is said to possess considerable alterative and diuretic properties. Its chemical examination by Mr. E. L. Cleaver shows the presence of an acrid resinous body, a red colouring matter, tannic acid, a volatile oil, and minute traces of an alkaloid. The juice of *Agave Americana* is spoken of as a valuable antiscorbutic, and the oil of *Aleurites Triloba* as a good substitute for castor oil. Prof. Maisch supplies an interesting report on the constituents and properties of the genus *Potentilla*, and a similar service is performed in reference to the genus *Eupatorium* by Dr. Bigelow.

The cinchona barks have again attracted a considerable amount of attention, and notably on the part of those whose names are

familiar to every pharmacist in connection with this subject. An animated discussion has been going on between Dr. O. Hesse and Dr. de Vrij in reference to the plant grown in Java for many years as *Cinchona Calisaya*. The relative proportion of its alkaloids, and especially the large amount of conchicine (Pasteur's quinidine) yielded by its bark, lead Dr. Hesse to the conclusion that this plant is not the true *C. Calisaya*, Weddell, but a distinct species. The correctness of this view is disputed by Dr. de Vrij, who asserts that Dr. Weddell himself regarded the plant in question as the true *C. Calisaya*, though an inferior variety; and that the large percentage of conchicine could not be looked upon as a characteristic feature. In reply to the latter statement, Dr. Hesse believes that Dr. de Vrij has relied on analytical results obtained by unsatisfactory methods, and quotes experiments of his in support of this assertion. He also publishes a new method for ascertaining the purity of sulphate of conchicine. In an article on "*Cinchona Hasskarliana of Java*," Dr. de Vrij objects to this name given by the late M. Miguel to a species of cinchona mentioned by M. Jobst, on the ground that he has seen this plant grow as a hybrid produced by the fecundation of the flowers of a weak *Calisaya* by the pollen of vigorous *C. Pahudianas* growing very near. He suggests for it the name *C. hybrida*. Mr. Howard gives an interesting account of a hybrid between *C. Calisaya* and *C. succirubra*, the bark of which presents, not merely the external characteristics, but also the chemical nature of both its progenitors. Some recent importations of cinchona barks have afforded Mr. Howard an opportunity of confirming an observation made by Dr. de Vrij of the presence of quinidine in the renewed bark of *C. succirubra*.

In commenting on the botanical source of medicinal rhubarb, M. Maximowicz admits that the *Rheum officinale* of Baillon yields a valuable commercial rhubarb, but shows that the drug known as Turkey rhubarb, which used to come to England through Siberia by way of Kiachta before the strict supervision of the Russian government shut it out from the British and other European markets, is the produce of *Rheum palmatum*.

Professor Bentley draws attention to a spurious chiretta, which in colour and general appearance closely resembles the officinal drug, but when carefully examined, presents several marked distinctive characters. He gives a minute description of this substitute, which he believes to be derived from *Ophelia angustifolia*. A spurious senna, devoid of purgative properties and differing considerably from the true article, is described by Mr. Holmes, and shown to be

the produce of *Cassia brevipes*, D.C., a native of Costa Rica and Panama. The occasional occurrence of large quantities of golden seal in serpentaria, is pointed out by Mr. P. L. Milleman.

Chemical and pharmaceutical research has been extended to a considerable number of vegetable drugs in addition to those already referred to. Kamala has been examined by Mr. C. Schneider; balsam of tolu by M. Carles; the oil of *Benzoin odoriferum* by Mr. P. M. Gleim; the bark of *Chionanthus Virginica* by Mr. R. S. Justice; the root of *Sanguinaria Canadensis* by Mr. L. C. Hopp; the herb of *Helianthemum corymbosum* by Mr. F. J. Kruell; and gum tragacanth by M. Giraud. Mr. E. B. Shuttleworth has examined the leaves of *Erythroxylon Coca*; Mr. Northam Bryan, the rhizome and rootlets of *Cypripedium acaule*; Mr. W. Dilmore, those of *Actæa alba*; Mr. C. L. Mitchell, the officinal veratrums; Mr. R. M. Cotton, the leaves of *Rhus venenata*; Professor Maisch, the leaves of Ericaceæ; and Mr. E. Marquis, the different kinds of sarsaparilla in reference to their therapeutic values. The microscope too has done its work in connection with pharmaceutical research, and notably so in the hands of Mr. H. Pocklington, who has extended his valuable investigations to the woods and leaves of the British Pharmacopœia. M. Cazeneuve reports the results of his examination of angostura bark and the bark of *Strychnos nux vomica*, showing that cells containing oxalate of lime are numerous in the true but absent in the false bark; that the red coloration by nitric acid is localized in the former and general in the latter; and that the epiphleum of the true bark is not coloured by nitric acid, while that of the false is turned emerald green.

The distinctive microscopical characters of Natal arrowroot, which on more than one occasion seem to have been the cause of error in the diagnosis of maranta starches, are ably illustrated by Mr. Greenish in a communication to the British Pharmaceutical Conference. Mr. Greenish considers this arrowroot to be the produce of *Maranta arundinacea*, but confesses himself unable to explain the cause of its marked difference from the products of the same plant grown in other localities.

As other important contributions to materia medica published during the past year, we must not omit to mention Dr. Porter Smith's report on the oils of Chinese pharmacy and commerce, and Mr. Holmes' notes on Brazilian drugs.

The pharmacy of guarana forms the subject of an elaborate discourse by Mr. J. B. Moore, whose remarks on this subject will no doubt prove very interesting to many of our readers; the more so

as they are coupled with valuable suggestions in reference to percolation and the preparation of medicinal extracts. Professor Flückiger publishes the details of his analyses of twelve samples of opium from different sources, in which the narcotine and morphine were estimated in accordance with the directions given in the *Pharmacographia*. The results show how very great and variable the difference between the amounts of crude and of purified morphine may be, and that a reliable and practical method for the estimation of this alkaloid in opium is still a desideratum. Mr. C. Horner calls attention to the fluorescence in castor oil of a number of substances which are not fluorescent when dissolved in water, alcohol, or alkaline solutions. Dr. C. R. C. Tichborne points to the presence of turmeric in adulterated mustard as an instance showing how well the fluorescence of a substance may be used for its detection in the presence of a non-fluorescent one, and recommends Mr. Horner's suggestion of the use of castor oil for intensifying the fluorescence of bodies which in alcoholic and other solutions exhibit this phenomenon in a less degree. Miss Kate Crane reports favourably on the cohesion figures of oils as tests for their identity and purity, and quotes the results of her experiments with a number of volatile and fatty oils. The difficult subject of the testing of fatty oils also receives a further contribution from Mr. J. J. Coleman. In the course of his experiments on the influence of heat on the preparations of sarsaparilla, Mr. J. F. Judge arrives at the conclusion that this drug is not injured medicinally by the heat of a water bath. The researches on pepsine by Scheffer, Symes, and others have led medical men and pharmacists to assume that this substance cannot exist in an active condition in the presence of alcohol, and that wines and elixirs must therefore be regarded as unsuitable vehicles for its administration. This view is strongly opposed by Mr. G. W. C. Phillips, who states that pepsine exists in the presence of alcohol in a latent state, and that it resumes its activity upon the dilution of the alcohol by water or the juices of the stomach.

A new and ingenious thermometric scale has been constructed by Mr. John Williams, by dividing the interval between the freezing and boiling points of mercury into 1000 degrees. The freezing point of water would thus be 100°, and its boiling point 350°, and five milligrade degrees would be equal to two degrees C. The obvious advantage of this milligrade scale consists in the fact that its low zero point and the small size of its divisions would render the frequent use of minus signs and of fractional numbers unnecessary. The readers of the *Year-Book* will find many interesting particulars

in connection with this subject in the admirable address delivered by the President of the British Pharmaceutical Conference at the Bristol meeting.

The literature of adulteration has again produced a number of valuable contributions, among which Mr. Wanklyn's book on Tea, Coffee, and Cocoa, and Mr. Allen's communications to the *Chemical News* on the detection of adulterations in tea, coffee, and mustard, take a prominent place. Mr. Wanklyn also publishes an improved process for the estimation of alum in bread and flour, which will be very acceptable to those engaged in this tedious and troublesome operation. The ash is moistened with strong hydrochloric acid, then boiled with water, the solution filtered from the precipitated silica, and the filtrate mixed with solution of ammonia in excess. The mixture containing the precipitated phosphates is now boiled with acetic acid, which dissolves the phosphates of calcium and magnesium, leaving the phosphates of aluminium and iron behind; the latter are then collected on a filter, washed, ignited, and weighed. The iron contained in the precipitate is, after reduction to the ferrous state, titrated with permanganate, and the quantity thus found calculated for phosphate, and deducted from the weight of the mixed phosphates. The number of milligrams of phosphate of aluminium obtained from 100 grams of bread represent, as Mr. Allen shows, the number of grains of alum contained in a four-pound loaf. Unadulterated bread yields, according to Mr. Wanklyn, a quantity of phosphate of aluminium equivalent to six grains of alum per four-pound loaf. The difficult subject of butter analysis has been much advanced by the researches of Messrs. Angell and Hehner, who find that the quantity of foreign fat in a sample of butter may be deduced with fair accuracy from the quantity of insoluble and non volatile fatty acids yielded by the sample, as these acids do not amount to more than 85.4 to 86.2 per cent. in pure butter fat, whereas other fats which can be used for the adulteration of butter contain 95 to 96 per cent., thus showing a difference of nearly 10 per cent. The details of the process, which deserves to be strongly recommended, will be found on page 135. Mineral acids in vinegar may be readily detected, as M. Strohl shows, by adding a minute quantity of freshly precipitated calcium oxalate, which will be dissolved if mineral acids be present. The chemistry of the peppers receives able treatment in the hands of Mr. Wynter Blyth, and the detection of adulterants in beer forms the subject of an elaborate investigation by Dr. G. C. Wittstein. As other useful contributions of this kind, may be mentioned the detection of

methyl alcohol in ethyl alcohol, by MM. A. Riche and C. Bardy; the estimation of chicory in coffee, by Mr. J. R. Leebody; the detection of adulterations in wines, by Prof. Nessler; another article on the same subject by M. Mellies; the adulteration of beeswax, by Dr. A. W. Miller; the adulteration and impurities of tartaric and citric acids, by Mr. A. H. Allen; the adulterations of opium, by Dr. A. Christison; and Mr. A. F. Haselden's report on scammony.

Suggestions for the improvement of the national Pharmacopœia form an important element in pharmaceutical literature, and to no one are pharmacists more indebted for valuable contributions of this kind than to Mr. Umney. Allusion has already been made to his suggestions in reference to citrate of lithium. In a paper entitled "*Rhamnus Frangula* versus *Rhamnus Cathartica*," Mr. Umney shows that the ripe buckthorn berries are difficult to obtain, and that the juice supplied by the simplers and others who collect the berries is generally very grossly adulterated, water being added to it to a very considerable extent. As a remedy for this unsatisfactory state of things he proposes the rejection of *Rhamnus cathartica*, and recommends suitable formulæ for a fluid extract and a syrup of the bark of *Rhamnus frangula*. In criticizing the wasteful process of the B.P. for the preparation of belladonna liniment, he points out that at the stage at which the Pharmacopœia directs the percolation to be stopped, the root, under the most favourable circumstances, is not half exhausted, and suggests the use of a solution of one part of alcoholic extract of belladonna in ten parts of spirit of wine, or the substitution of ten ounces of finely-powdered root for the present twenty ounces of coarse powder. Mr. Umney's statement as to the insufficiency of litharge in the officinal lead plaster, and his recommendation to use litharge and oil in the proportion of one part to two will, we feel sure, be very generally endorsed by those engaged in its preparation. Mr. Symons' suggestion to use castor oil in the preparation of linimentum terebinthinæ aceticum, in order to facilitate the combination of turpentine with the spirit and acetic acid, appears to be a thoroughly practical one, and likely to be adopted in the next revision of the B.P. There is still much room, however, for useful work of this kind, and it is to be hoped that a much larger number of those capable of rendering such valuable services to pharmacy will devote some of their time and energy to a critical examination of the Pharmacopœia, and to suggestions for its further improvement.

PHARMACEUTICAL CHEMISTRY.

YEAR-BOOK OF PHARMACY.

PART I.

PHARMACEUTICAL CHEMISTRY.

Kosin. F. A. Flückiger and E. Buri. (*Archiv der Pharmacie*, Sept., 1874, 193.) In 1840, Wittstein discovered in the koso (cusso) flowers an acrid resin, which Martin in the same year appears to have obtained in crystalline form. In 1857, Harens attributed to it acid properties; in 1858, Paresi stated that he obtained it by means of alcohol and calcium hydrate. The same method was employed by Dr. Bedall, of Munich, in 1862. From the aqueous residue of the alcoholic extract, the koussin of Bedall, existing as a calcium compound, is precipitated by acetic acid as a more or less crystalline whitish powder, having the composition $C_{26}H_{44}O_5$. Of this substance the flowers yield at the most three per cent. In 1867, Bedall recognized it as the anthelmintic principle of the drug, and introduced it into the materia medica.

Through the kindness of Dr. E. Merck, of Darmstadt, the authors were put in possession of some beautifully crystallized kosin prepared by him. It appears in the form of needles some millimetres in length, or of short thick prisms, which Prof. Groth showed to belong to the rhombic system. If concentrated sulphuric acid at a temperature not exceeding $15^{\circ}C$. be saturated with kosin, the kosin is deposited, in the cold, in simple rhombic forms or in stellate groups; most frequently, however, in twin crystals with interlacing angles. The specific gravity of kosin is so considerable that in sulphuric acid of sp. gr. 1.842 at 15° , it quickly sinks to the bottom. The colour of the crystalline needles is similar to that of sulphur; the larger prisms are of a somewhat darker yellow; while in the very fine ramifications, the kosin appears to be white. It possesses neither smell nor taste, and when moistened with water or alcohol does not change litmus paper. Kosin bears being kept for a considerable time at $100^{\circ}C$., with as little loss of weight as over sulphuric acid or by fusing. Heated to about $140^{\circ}C$. in a narrow

tube, it begins to soften; and at 142° C. it fuses without decomposition. After cooling, it remains perfectly transparent; but if this amorphous kosin be brought in contact with a single drop of alcohol, tufts of radiating crystals are immediately developed at numerous points, a process which is most readily observed under the microscope, and which may be repeated with the smallest particle of this substance. This change of form is not produced by water. The application of stronger heat develops the odour of butyric acid, and produces a reddish brown tar, which imparts a brown coloration to a dilute solution of ferric chloride. Heated in a current of carbonic acid gas, kosin does not sublime, but extends itself far along the sides of the tube.

Water boiled with kosin acquires a slight opalescence, without, however, any sensible quantity entering into solution. On the other hand, it is very freely taken up by ether, benzol, carbon bisulphide, and chloroform; less freely by glacial acetic acid and alcohol. 1000 parts of the latter (sp. gr. $\cdot 818$) at 12° C. is capable of dissolving 2.3 parts of kosin; but boiling alcohol dissolves it readily. By slowly cooling such a solution, the kosin is obtained well crystallized, but not by evaporation. Crystals are equally well obtained from a hot saturated solution in glacial acetic acid upon cooling. The alcoholic or acetic mother liquor is subsequently rendered but slightly opalescent by water.

The solution of kosin in 20 parts of chloroform exercises no rotary influence in a tube 25 millimetres long; while in a 50 millimetre tube the solution is not transparent enough for this examination.

In two parts of concentrated sulphuric acid at 15° C., one part of kosin forms a yellowish solution wherein no change is produced by strong nitric acid. The solution quickly becomes of a clear yellow; and after longer standing in the cold, a brownish and then a scarlet colour; the latter colour may be produced at once by warming gently, so that sulphurous acid is not developed. In this case especially the smell of butyric acid is developed. This is also the case when kosin is heated with nitric acid, sp. gr. 1.2. From the yellow solution kosin is precipitated as a whitish turbidity on the addition of water; but when the solution has become red by time or by heat, it deposits scarlet-coloured flakes.

A cold saturated alcoholic solution of kosin is at first scarcely altered by alcoholic solution of perchloride of iron, but after a short time the mixture assumes a fine and permanent red colour. The same solution gradually acquires a similar colour in contact with reduced iron.

Pure solutions of kosin are reddened along the sides of the dish during slow evaporation.

An alcoholic solution of neutral acetate of lead causes no precipitation from an alcoholic solution of kosin. Dissolved in chloroform, kosin is not perceptibly changed by bromine.

Aqueous solutions of the caustic and carbonated alkalies, but not of borax, readily dissolve kosin, especially if gently heated; the yellow colour of these solutions also is changed to red by heating or long standing.

Upon neutralizing these alkaline solutions, either a white amorphous or pale yellowish microcrystalline precipitate is formed (according to the temperature and concentration), which, when well washed, is tasteless and indifferent to litmus paper. Rapid exsiccation lessens its volume; but when dried by exposure to air at ordinary temperature, it may be heated to 100° without loss of weight. The same behaviour is shown by kosin, which after precipitation from alkaline solution is immediately taken up by ether or chloroform.

The colourless appearance of the amorphous precipitate is caused solely by its minute state of division, for its alcoholic solution yields again the former yellow crystals; and a white amorphous substance, when carefully dried and fused, forms beautiful yellow needles as soon as it is brought in contact with alcohol.

Heated in closed tubes with dilute sulphuric acid during a considerable time, kosin suffers no perceptible change.

If kosin be fused with caustic potash, and the mass dissolved in water, no precipitation takes place upon supersaturation with sulphuric acid; but the mixture smells of formic and butyric acids, and contains oxalic acid.

The combustion of kosin in a current of oxygen, which left scarcely a trace of ash in the platinum boat, gave the following percentage composition:—

	I.	II.	III.	IV.
C	65.06 . . .	64.92 . . .	64.25 . . .	64.23
H	6.73 . . .	6.81 . . .	6.61 . . .	6.52

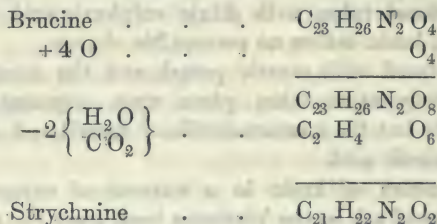
From these results the formula $C_{31}H_{38}O_{10}$ is calculated, which requires:—

31 C . . .	372 . . .	65.26
38 H . . .	38 . . .	6.66
10 O . . .	160 . . .	28.08
	<hr/> 570	<hr/> 100.00

Having thus stated the composition and the chemical and physical properties of kosin, the authors give an account of their experiments in reference to the action of concentrated sulphuric acid, of sodium amalgam, and of acetic anhydride upon this substance. They intend to resume and complete these researches, which at present lead to the conclusion that kosin is an ether of isobutyric acid. As to the relation between their kosin and Bedall's koussin, they suppose that variable quantities of the former are present in the latter. The kosin they have examined is a chemically pure substance, which is not the case with Bedall's preparation. Prof. Buchheim, who has tested the medicinal effect of the pure preparation, states that its anthelmintic action is very much inferior to that of Bedall's koussin. From this it follows that even if the action of koussin should be attributable to the presence of kosin, the latter would require to be in the same form in which it exists in the former in order to produce its full anthelmintic effect.

Pure kosin is not likely, therefore, to find a place in the list of recognized medicines.

Conversion of Brucine into Strychnine. F. S. Sonnenschein. (*Ber. deutsch. Chem. Ges.*, 1875, 212.) In comparing the formula of brucine with that of strychnine it will be seen that the former may be converted into the latter by the addition of four atoms of oxygen and the elimination of two molecules of H_2O and C O_2 .



The actual conversion of the one alkaloid into the other is effected in the following manner:—

Brucine is gently heated with four to five times its weight of dilute nitric acid in a flask; a red solution is obtained, and a mixture of gases containing C O_2 . The red solution is concentrated by evaporation on a water bath, and then mixed with an excess of hydrate of potassium, and shaken with ether; the ethereal solution leaves on evaporation a reddish yellow residue, consisting of a yellowish resin, some red colouring matter, and an alkaloid. The latter when dissolved in an acid and purified by recrystallization, possesses all the chemical properties of strychnine. Its hydrochlorate

forms fine silky, needle-shaped crystals, containing 9.20 of chlorine; the hydrochlorate of strychnine, $C_{21}H_{22}N_2O_2, HCl$, requires 9.58 per cent.

The convertibility of brucine into strychnine is not only of general scientific interest, but also important from a practical point of view, as may be seen from the following case:—

A student in the author's laboratory received a mixture containing brucine and nitrate of lead for examination. By Stass Otto's method he separated the base, which, contrary to all expectation, did not show the reactions of brucine, but those of strychnine. The brucine used for this mixture was quite free from strychnine.

Creatine. M. Engel. (*Journ. de Pharm. et de Chim.*, 4th series, xx., 103.) It is well known that nitrate of silver and ammonio-nitrate of silver produce no effect on a solution of creatine. But if a saturated solution of creatine is mixed with a solution of nitrate of silver, and then with a little potash, a white precipitate is produced, which is soluble in an excess of potash. After a short time the liquid changes to a gelatinous, transparent mass, which becomes reduced immediately on heating, and after several hours in the cold.

Care must be taken not to have an excess of nitrate of silver, as the presence of the potash would cause the production of an olive precipitate of oxide of silver.

Five or six drops of a solution of nitrate of silver are mixed with two cubic centimetres of a cold saturated solution of creatine; potash is then added drop by drop until the precipitate formed is re-dissolved.

This test is characteristic of creatine. It is evidently based on the formation of a compound of creatine with oxide of silver.

A combination of creatine with oxide of mercury can be obtained by adding corrosive sublimate, and subsequently potash, to a solution of creatine in excess, and shaking the mixture for a few seconds; a *white* crystalline precipitate is formed, which is insoluble in an excess of potash, and is *not blackened* by it. Reduction takes place in the cold after some time, but more rapidly on the application of heat. If corrosive sublimate is added drop by drop to a solution of creatine containing an excess of potash, the same white precipitate is obtained; but a yellow coloration due to mercuric oxide is produced by a slight excess of sublimate after the complete precipitation of the creatine. This reaction may probably lead to a method for the volumetric determination of creatine.

Note on Veratrine. M. Lepage. (*Journ. de Pharm. et de Chim.*, 1874, 300.) The author finds that the light and pulverulent veratrine, as generally met with in commerce, is not the preparation

crystallized from pure ether prescribed by the French Codex, but is merely the precipitate produced by ammonia on another alkali from the sulphuric solution of the alkaloid decolourised by charcoal. When treated with ether of 65° B., this commercial preparation always leaves a brown residue (veratrine of Couerbe), which is soluble in alcohol, and may amount to as much as 20 per cent.; whereas veratrine prepared in strict accordance with the directions of the Codex, is a colourless resinoid substance, entirely soluble in ether. The pharmacist who does not prepare his own veratrine, should not neglect to test the purchased article, with regard to its solubility in ether of 65° B.; should a residue be left, the preparation must be purified by treating it with six or eight times its weight of ether, decanting the clear solution from the insoluble matter, and allowing the ether to evaporate. The following two tests are characteristic of veratrine:—A particle placed in contact with 10 grains of sulphuric acid imparts to it a yellow tint, which soon changes to a deep and persistent blood-red. A few centigrams of the alkaloid when boiled with ten c.c. of hydrochloric acid produce a fine purplish red coloration in the liquid.

Some authors state that veratrine imparts a scarlet colour to nitric acid. M. Lepage has not been able to obtain this reaction; he has never observed more than a light yellow coloration which soon disappears.

Hæmatoxylin as an Acidimetric Indicator. O. Maschke. (*Archiv der Pharmacie*, 1875, iii., 34.) A dilute aqueous solution of hæmatoxylin, when heated to the boiling point, in a platinum dish in an atmosphere free from ammonia, assumes a brownish or brownish yellow colour. If the same experiment be performed in a test tube, instead of a platinum vessel, a purplish red coloration is produced in a few seconds, even before the temperature of the liquid reaches the boiling point. This phenomenon is due to the trace of alkali dissolved from the glass by hot water, and shows the great delicacy of the reaction of hæmatoxylin with alkalies, which may also be judged from the following experiment:—2 c.c. of a solution of bicarbonate of sodium containing half a milligram per litre, were heated in a platinum dish, with one drop of cold saturated aqueous solution of hæmatoxylin. After a few seconds, the liquid showed a distinct red coloration, which rapidly increased in intensity.

The behaviour of hæmatoxylin to acids is less striking. To highly diluted acids it imparts a brown, brownish yellow, or yellow, and to less diluted acids, a pink colour. The latter changes on standing, or especially on heating, to brown or yellow.

The foregoing statements show the applicability of hæmatoxylin as an indicator in acidimetric determinations. The acid is largely diluted with water, mixed with one drop of solution of hæmatoxylin, and heated in a beaker; when hot, the standard solution of alkali is added drop by drop from a burette. It is necessary to heat the mixture, as carbonic acid interferes with the reaction. The great advantage of the use of hæmatoxylin as an indicator consists in this, that non-volatile acids may be titrated directly by means of an alkaline bicarbonate. The author employs a solution of bicarbonate of sodium containing one half of an equivalent in one litre. The saturated solution of hæmatoxylin can be preserved by keeping it under benzol, and protecting it from the light. The accuracy of the methods is shown by the following results:—

Oxalic acid used.	Solution of NaHCO_3 .	Calculated quantity of solution of NaHCO_3 required.
1. 0.7871 gram.	24.95 c.c.	24.98 c.c.
2. 0.5149 „	16.30 „	16.35 „
3. 0.6669 „	21.05 „	21.17 „
4. 0.6205 „	19.55 „	19.70 „

Crystallized Digitalin. M. Nativelle. (*Journ. de Pharm. et de Chim.*, 4th series, xx., 81; *Pharm. Journ.*, 3rd series, v., 203.) The process described by the author in his former paper on the preparation of crystallized digitalin, is one that presents considerable difficulties, and in unpractised hands has frequently only yielded negative results. Sensible of this, M. Nativelle has during the past two years sought to discover a satisfactory modification of it, and he has recently communicated to the Academy of Medicine and the Society of Pharmacy in Paris the details of a process by which he states the new substance can be obtained inexpensively in considerable quantity, and absolutely pure. The modification consists chiefly in the separation of digitalin from the digitin by means of chloroform, and afterwards removing the yellow oily substance, which accompanies the digitalin and retards its crystallization, by treatment with ether.

Before describing the process, the author gives some details as to the comparative value, for the purpose, of digitalis in its different stages of growth. The plant of the first year, especially that which is collected too young, is not rich in crystallizable digitalin; fleshy and full of juice, it abounds in digitalein and extractive matter. Digitin, a crystallizable but inert substance, which must not be confounded with the active principle, is present in it as in the older plant. The plant of the second year's growth, collected just when

the first flowers appear, using only the leaves from which the petioles have been removed, is what the author has found most suitable, both for the preparation of digitalin and for use in the natural state.

M. Nativelle's experiments confirm the observations of previous authors as to the comparative value of different parts of the plant. He has found that the root, stems, petioles, and veins, contain only a very small proportion of the active crystallizable principle, and in operating upon equal quantities of the petioles and of the green portion of the same leaves from which the petioles had been removed, he obtained five times as much crystallized digitalin from the latter as from the former. Thus selected, the ordinary yield of digitalin is one part in one thousand; but from the mature plant collected in the Vosges, he has obtained 12 centigrams to the 100 grams.

The following are the details of the process:—

Digitalis Leaves (Vosges), in moderately fine powder	1000	grams.
Neutral Plumbic Acetate	250	"
Distilled Water	1000	"

The lead salt is dissolved in the cold water, the powder added and thoroughly mixed, then passed through a sieve and left in contact during twenty-four hours, taking care to stir it together from time to time. The mixture is next exhausted in a displacement apparatus, with 50° alcohol, until it ceases to impart any bitterness. To this liquor is added 40 grams of bicarbonate of soda dissolved to saturation in cold water. The effervescence having terminated, the spirit is distilled off, and the remaining liquor evaporated in a water bath to about 2000 grams; it is then allowed to cool, and diluted with six times its weight of water. Two or three days afterwards the clear liquor is decanted by means of a siphon, and the precipitate drained and pressed.

The extractive liquor being thus removed, the precipitate weighs about 100 grams. This is suspended in about 1000 grams of 80° alcohol, and the whole passed through a fine metallic or silken sieve. The resulting turbid liquor is then heated to ebullition, and ten grams of neutral plumbic acetate added to it; the heat is continued for a few minutes, and the liquor filtered through paper. Upon the deposit in the filter alcohol is poured, to remove any liquor it may retain, and it is then pressed. To the liquor is added 50 grams of quite neutral vegetable charcoal, in fine powder, and it is then distilled. The charcoal remaining is heated for some time in a water bath to drive off any alcohol it may retain, then allowed to cool, and put to drain upon the sieve used for the separation of

the precipitate, and thus separated from the coloured liquor. This charcoal is dried in a stove, and exhausted by displacement with chloroform, until the latter passes through colourless. This liquor is distilled to dryness, and the residue is crude digitalin, mixed with a pitchy substance and oil. It is dissolved by heat in 100 grams of 90° alcohol, one gram of neutral plumbic acid dissolved in a little water is added, and ten grams of washed animal charcoal in fine grains without powder; after boiling for ten minutes it is allowed to cool. After the liquor has settled, it is filtered through a glass cylinder, furnished with a tight cotton plug; it passes quickly and clear, and to the residue the deposit is added, and the whole exhausted of all bitterness by alcohol, which is afterwards distilled. The digitalin appears in a crystalline grumous mass, contaminated by the coloured oil. It is separated from the small quantity of aqueous liquor in which it is found, then dissolved by heat in 10 grams of 90° alcohol, five grams of rectified sulphuric ether, and 15 grams of distilled water added, and the whole shaken together in a stoppered vessel. Two layers are formed: the upper is coloured, and consists of ether which has taken up the fat oil; the lower is colourless and contains the digitalin, which, being set free, quickly crystallizes. Two days afterwards the whole is poured into a small cylinder, furnished with a tight cotton plug, the mother liquor passes through, and then the coloured layer, what remains of the latter adhering to the crystals being washed off by a little ether.

This first crystallization of digitalin is slightly coloured. To obtain it perfectly white, two purifications are necessary; but previously a treatment with chloroform is indispensable to separate about one-tenth its weight of digitin, which it still retains. The digitalin, well dried, is, therefore, reduced to a fine powder, and dissolved in 20 parts of chloroform, and the solution filtered through a tight plug of cotton. The clear liquor which passes is distilled to dryness, and a little alcohol then added for the purpose of removing by evaporation the last traces of chloroform.

This digitalin is dissolved in 30 grams of 90° alcohol, five grams of washed animal charcoal in granules added, the liquor boiled during ten minutes and filtered, the charcoal exhausted as before, and finally the product is distilled; the digitalin crystallizes on the sides of the vessel, but it is still coloured. To obtain it white, it is again dissolved by heat in eight grams of 90° alcohol, four grams of ether, and eight grams of water added, and the whole shaken together in a close vessel. After being exposed during a

night, nearly the whole of the digitalin is deposited in small white acicular groups; that which still retains colouring matter (about one-fifth) remains in the mother liquor, from which, however, it can be purified with very little loss. The whole is poured into a cylinder, as before described, and the crystals washed with ether.

The digitalin, so obtained, is white and pure; but, by a further treatment, it may be obtained still more beautifully and perfectly crystallized. For that, it is dissolved in 25 parts of 93° alcohol, and treated with five parts of animal black as before. The colourless liquor obtained is distilled until reduced to 10 parts; the heat is then raised to the boiling point, to dissolve a little digitalin that is deposited, and the solution poured upon a slightly heated glass, supported under a bell-glass, and covered with a disk. The crystals then form slowly in groups or bundles of very white slender brilliant needles. When they no longer appear to augment, the disk is removed, and the alcohol being nearly evaporated, the crystals are dried in the air upon folds of paper.

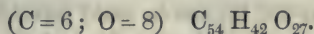
The Chemical Nature of Digitalin. C. Kosmann. (Abstract of a paper in the *Journ. de Pharm. et de Chim.*, 4th series, xx., 427; *Pharm. Journ.*, 3rd series, v., 545.)

Digitalis purpurea contains an immediate principle which has been named successively digitalin, digitasolin, and digitaletin. This substance is soluble in water; it is very hygroscopic, and readily altered by the action of water, acids, and alkalies. By the action of dilute H_2SO_4 or HCl , it splits up into glucose and insoluble digitalin; the latter by the further action of the acid forms glucose digitaliretin (paradigitaletin), and this, under the same influence, is ultimately decomposed into dehydrated digitaliretin and water.

Soluble digitalin is the immediate principle existing in the plant, the other substances named being merely derivatives produced from it by the action of heat, water, acids, and other agents. The ease with which it suffers chemical changes accounts for the fact that it is always obtained from the plant together with the insoluble. Both digitalins are glucosides; they are very bitter and energetic in their physiological action. The soluble is principally manufactured in Germany, the insoluble in France. The yield obtained according to the German process is:—

Soluble Digitalin (very pure and active)	0.623	per cent.
Insoluble ,, ,,	0.167	,,
Total . . .	0.790	

Soluble digitalin was analyzed with the following results:—

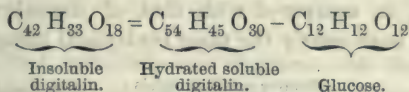


		Required for formula.
C	55.26	55.69
H	7.89	7.26
O	36.85	37.05
	<hr/> 100.00	<hr/> 100.00

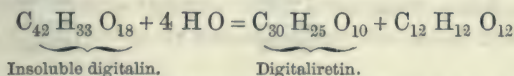
Soluble digitalin attracts water with avidity, and some which the author analyzed in 1859 corresponded with the formula $C_{24} H_{42} O_{27} + 3 H O$. On the other hand, insoluble digitalin, called also, in Germany, digitaletin, gives upon analysis:—

C	58.741
H	7.692
O	33.567

Its formula is:—



Insoluble digitalin, treated with dilute sulphuric acid, gives up another molecule of glucose, and is converted into digitaliretin.



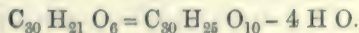
Digitaliretin yielded upon analysis:—

	Required for above formula.
C	63.225 63.50
H	8.414 8.77
O	28.361 27.73
	<hr/> 100.000

By the prolonged action of dilute sulphuric acid and heat, digitaliretin loses four molecules of water, and becomes dehydrated digitaliretin, which gives:—

C	72.289
H	8.434
O	19.277
	<hr/> 100.000

This is the last stage of the decomposition of digitalin. Its formula is:—



It approaches closely the true resins in its large proportion of carbon. It melts at 60°C ., has an acrid taste, is insoluble in water, and soluble in ammonia, ether, and alcohol; whilst digitaliretin ($\text{C}_{30}\text{H}_{25}\text{O}_{10}$) commences to melt at 169°C ., is insoluble in water, ammonia, and caustic soda, slightly soluble in ether, soluble in warm alcohol, and has a slightly bitter taste. It occurs as a glistening crystalline powder, or in nacreous scales. The Germans also call it paradigitaletin.

If soluble digitalin be compared with salicin, it will be seen that there is a great resemblance between the two bodies: one molecule of soluble salicin by the loss of two molecules of glucose being converted into saligenin, much less soluble; and this by the loss of two molecules of water becomes insoluble saliretin. Moreover, salicin combines with bases, and the author has obtained a digitalinate of soda perfectly crystallized in a radiate form.

If the composition of the crystallized digitalin of MM. Homolle and Nativelle, be compared with that of digitaliretin, it will be seen that they have nearly the same centesimal composition.

	Homolle and Nativelle's crystallized digitalin.	C. Kosman's digitaliretin.
C	62.08	63.225
H	8.23	8.414
O	29.69	28.361
	<hr/> 100.00	<hr/> 100.000

In fact, it is intermediate between insoluble digitalin and digitaliretin. For instance, if one molecule of insoluble digitalin and two molecules of digitaliretin be taken ($= \text{C}_{42}\text{H}_{33}\text{O}_{18} + 2\text{C}_{30}\text{H}_{25}\text{O}_{10}$), a mixture is obtained which has the centesimal composition:—

C	61.261
H	8.308
O	30.431
	<hr/> 100.000

closely approaching that of the crystallized digitalin of MM. Homolle and Nativelle. If one molecule of the former and three of the latter be taken, the mixture will contain in 100 parts:—

C	61.682
H	8.411
O	29.907
	<hr/> 100.000

The author therefore considers it possible that the crystallized digitalin of MM. Homolle and Nativelle is a product which has already undergone partial alteration by the multiplicity of the manipulations. He further thinks it important that in medicine the soluble or insoluble digitalin, as obtained by the ordinary methods, should be adhered to, that product being very efficacious.

As to the digitalin of M. Nativelle, the author is induced to believe that it is far from being sufficiently pure for an ultimate analysis. It gives for 100 parts:—

C	54.72
H	9.22
O	36.06

These figures indicate no rational formula; divided by their equivalents they give $C_{18}H_{18}O_9$. If the centesimal figures were:—

C	55.26
H	7.89
O	36.85

it would follow that this body was identical with the before mentioned soluble digitalin, but the analysis of M. Nativelle gives considerably too much hydrogen.

In conclusion, the author considers himself justified in asserting that it is the soluble digitalin which is primarily elaborated by the plant, and which yields by decomposition the other above named products.

Active Principles of Foxglove. Prof. Schmiedeberg. (Abstract of a paper in the *Archiv für experiment. Pathol. und Pharmacol.; Pharm. Journ.*, 3rd series, v., 741.) The author has prepared a new, well-defined, crystallizable principle, *digitoxin*, from the leaves of *Digitalis purpurea*, and exactly investigated the constituents of commercial "digitalin," as obtained from seeds of the same plant.

As to *digitoxin*, Schmiedeberg completely exhausted with water the leaves, previously dried and powdered, and then extracted them repeatedly with dilute alcohol, of 50 per cent.; the tincture thus obtained was then mixed with basic acetate of lead as long as it produced a precipitate. The latter being separated, the filtered liquid was concentrated, and the deposit now formed, after some days, removed from the aqueous liquid. It was then washed with a dilute solution of carbonate of sodium, by which a yellow matter (*chrysophan*?) was partly removed. The substance was then dried, and yielded to chloroform a brownish mass, which, after the chloroform had been driven off, was purified by benzin. This liquid dissolved

the remainder of the yellow or orange matter and a little fat, leaving crude digitoxin, which is to be purified by recrystallization from warm alcohol, 80 per cent., adding a little charcoal. This purification still yields yellowish crystals, which ought to be washed again with carbonate of sodium, ether, or benzin, and then recrystallized from warm absolute alcohol, containing a little chloroform. This process, however, will only afford colourless crystals provided it be so performed as to cause the separation of digitoxin, on account of the cooling of the solution, not by the evaporation of the solvent. If the liquid is instead allowed to evaporate, it will soon assume a darker coloration. In the way just pointed out, perfectly colourless scales or needle-shaped crystals of pure digitoxin are at length formed, the yield being not more than about *one* part from 10,000 of dried leaves.

Digitoxin is insoluble in water, to which it does not even impart its intensely bitter taste as displayed in alcoholic solution. It is likewise insoluble in benzin or bisulphide of carbon, very sparingly soluble in ether, more abundantly so in chloroform, the latter liquid however acting but very slowly on digitoxin. Its best solvent is alcohol, either cold or warm. The composition of digitoxin answers to the formula $C_{31}H_{33}O_7$.

Digitoxin warmed with concentrated hydrochloric acid assumes a yellow or greenish hue, the same which is commonly attributed to commercial "digitalin." Digitoxin is not a saccharogenous matter; in alcoholic solution it is decomposed by dilute acids, and then affords *toxiresin*, an uncrystallizable, yellowish substance, which may easily be separated on account of its ready solubility in ether; it appears to be produced also if digitoxin is maintained for some time in the state of fusion at about 240° C. Toxiresin proved to be a very powerful poison, acting energetically on the heart and muscles of frogs. The very specific action of foxglove is due—not exclusively—to digitoxin; it is so highly poisonous that Schmiedeberg thinks it not at all fit for medicinal use which might rather be confined to other constituents of foxglove, as, for instance, to those described further on under the names of digitalin and digitalein. The latter, however, are of more difficult extraction than digitoxin.

The preparation of digitoxin is similar to that of Nativelle's crystallized "digitalin;" the former as well as paradigitogenin (of Schmiedeberg), is largely found in Nativelle's digitalin.

Foxglove growing abundantly in Alsace, there is at Strassburg a firm, Messrs. Henn & Kittler, making digitalin from seeds on a somewhat large scale. They exhaust the seeds with alcohol, 50

per cent., distil off the alcohol in a vacuum apparatus, purify the liquid by means of acetate of lead, and add tannic acid. From the precipitate now formed and immediately dried, "digitalin" is separated by means of oxide of zinc. It is a whitish powder, almost completely soluble in water, and acting very energetically.

This commercial digitalin chiefly furnished the materials of Schmiedeberg's researches on the principles afforded by the *seeds of foxglove*. Among them three substances are directly obtainable, being no doubt contained in the seed itself; whereas, five other substances are artificially derived from the former, viz. :—

I.—*Digitonin*, an amorphous body, soluble in water; not in cold alcohol, nor in ether, benzol, or chloroform. It yields by decomposition sugar, and gradually the following derivatives :—

1. Digitoresin.
2. Digitonein.
3. Digitogenin.
4. Paradigitogenin.

II.—*Digitalin*; it forms roundish, not crystalline, tufts; sparingly soluble in cold water, ether, or chloroform; abundantly in alcohol, or in alcohol containing chloroform. Digitalin is likewise dissolved by even dilute acetic acid as well as by boiling water; it may be split up into sugar, and—

1. Digitaliresin, which again may be resolved into substances not yet more exactly examined.

III.—*Digitalein*, a yellowish substance, affording with water frothing solutions like digitonin, yet differing from it by being soluble in chloroform. The product it yields by boiling with dilute acids appears to agree with digitaliresin.

I. *Digitonin*.

Commercial digitalin, as alluded to, is moistened with absolute alcohol, and then treated with a mixture of equal volumes of alcohol and chloroform, which will dissolve the greater part of the digitalin. The filtered liquid, on addition of ether, yields digitonin, which is to be subsequently dissolved by warm alcohol, purified by charcoal, and again precipitated by ether. Digitonin may also be prepared by mixing a concentrated aqueous solution of "digitalin" with baryta, when a precipitate is thrown down, from which carbonate of barium may be separated by means of carbonic acid. Digitonin then remains in the liquid, which is to be cautiously concentrated, diluted by alcohol, and then mixed with a little ether in order to precipitate first some impure digitonin. This being removed, and more ether

added, nearly pure digitonin makes its appearance; it is perfectly purified by repeating this treatment, which, however, will unavoidably cause a considerable loss of digitonin. Its aqueous solution partakes of the frothing quality of solutions of *saponin*; and, in fact, digitonin and saponin are very closely allied. Schmiedeberg assigns to digitonin the formula $C_{31}H_{52}O_{17}$, Rochleder's formula of saponin being $C_{32}H_{54}O_{18}$.

Digitonin turns red by boiling with dilute sulphuric acid, not so saponin. The former then yields a flocculent matter, consisting of *digitoresin* and *digitonein*; digitoresin may easily be removed by means of ether. Digitonein is insoluble in boiling alcohol, or in alcohol containing chloroform, and is separated from these solutions by ether in form of white tufts, devoid of crystalline structure. Digitoresin, as well as digitonein, is further resolvable into sugar and substances which remain to be examined. The product thus afforded by digitonein yields, with concentrated sulphuric acid, a brown liquid, displaying in sunshine a magnificent green fluorescence. Lastly, digitoresin and digitonein have also been observed in an aqueous solution of digitonin, mixed with an aqueous infusion of foxglove leaves, the whole liquid being kept for some months at a temperature of 35° , when a slow fermentation took place.

A crystallized substance, *digitogenin*, is afforded if either digitoresin or digitonein in alcoholic solution is boiled for a day or two with dilute sulphuric or hydrochloric acid. The alcohol is removed by distillation, the yellow residue washed with water, and crystallized from hot alcohol. The long, colourless, needle-shaped crystals of digitogenin are abundantly soluble in chloroform, but little in ether. They are not coloured by cold concentrated sulphuric acid, but turn yellow by warming, and then display the same green fluorescence as the above-mentioned derivative of digitonein.

On exposing a solution of digitonin to slow fermentation there is found a considerable deposit, from which *paradigitogenin* may be extracted by chloroform; it is likewise crystallizable, and very closely allied to digitogenin. Yet paradigitogenin, when moistened with cold concentrated sulphuric acid, assumes a reddish brown hue; that substance is also readily formed by heating commercial "digitalin" with water to about 210° or 220° C. Paradigitogenin has been proved to be present to some extent in Nativelle's digitalin; it agrees, perhaps, with the "digitalose" of Homolle and Quevenne.

II. Digitalin.

This appellation has been applied by Schmiedeberg to a very

well defined substance, which he removed from commercial digitalin by a mixture of 1 volume of ether and 3 volumes of alcohol. The liquid is repeatedly shaken with small quantities of water, which will dissolve both *digitalin* and *digitaleïn*; although pure digitalin, if not accompanied by other constituents of foxglove, would not dissolve in water. From the above liquid the ether is distilled off, and water is added, and then if the liquid be concentrated by gently warming it, a flocculent whitish or yellowish mass of Schmiedeberg's digitalin is obtained. The same may also be got from the ethereal solutions, which had furnished digitonin, as above said. Crude digitalin is contaminated with a yellow matter, probably *chrysophan*. This is removed by using a weak solution of carbonate of sodium; the digitalin is then washed with chloroform, dissolved in warm dilute alcohol, from which it separates on cooling in a few days. It is not convenient to evaporate the solution of digitalin, because it would quickly darken, even in presence of charcoal. Digitalin forms soft, colourless, small grains, agreeing in composition with the formula $C_5 H_8 O_2$; the solvents for this substance are alcohol, alcohol containing chloroform, and dilute acetic acid; whereas it is but sparingly dissolved by ether or chloroform, still less by water, even when boiling. This well defined digitalin possesses in a high degree the action of foxglove on the heart; it is the prominent constituent of several kinds of commercial digitalin, especially that of Homolle and Quevenne.

Schmiedeberg's digitalin dissolves in cold concentrated sulphuric acid without assuming any coloration; it strikes yellow or yellowish green when warmed, and beautifully red if a little bromide of potassium be added. At the same time sugar and *digitaliresin* are produced; the latter is, like its mother substance, a very powerful poison. Yet digitaliresin itself is further capable of being resolved into sugar and another derivative, which is devoid of any active virtue. Digitaliresin is, on the whole, nearly allied to digitoresin.

III. *Digitaleïn*.

In order to get this substance, the liquid, which had already yielded digitalin, is evaporated *in vacuo*, the residue dried over sulphuric acid and dissolved in absolute alcohol. On addition of a little ether, impure digitaleïn separates, the liquid at the same time becomes perfectly clear. On further addition of ether, purer digitaleïn is precipitated. The resolution and precipitation is to be repeated until the digitaleïn turns no longer red with boiling concen-

trated hydrochloric acid, but only yellowish. It has nevertheless, not yet been possible to deprive it entirely of a yellowish hue. In other respects digitaleïn agrees with digitalin, but the former is abundantly soluble in water, and this solution froths like that of digitonin. Digitaleïn is, on the other hand, also readily dissolved by absolute alcohol, while digitonin is not so.

The Alkaloid of Hops. V. Griessmayer. (*Pharmacist*, Dec., 1874, 355; from *Dingler's Polytechnic Journal*.) In order to ascertain with certainty whether an alkaloid really exists in hops, the author undertook a careful investigation of the subject, from which the following details are quoted:—

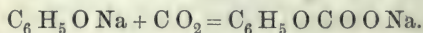
Ten pounds of hops were boiled for three hours in about three hectolitres of water, and afterwards boiled again for seven hours and the decoction concentrated to 70 litres. One-half of this was distilled with caustic potash, the other with calcined magnesia, and about 25 litres of distillate obtained. Both distillates had an alkaline reaction, and a strong odour, due, no doubt, to trimethylamin, besides a slight ammoniacal smell; with acetic acid they gave a slight cloud, with hydrochloric acid a strong one. With nitrate of cobalt both distillates gave precipitates; the supernatant liquid was green in the potash distillate, but rose-red in the magnesia distillate. The supposition that there was no ammonia in the latter was found to be incorrect; but the quantity was less. In other respects, both distillates were so similar that the author did not treat them separately. The mixed distillates were distributed in different dishes, some being neutralized with oxalic, some with sulphuric, and some with hydrochloric acid, and then evaporated to dryness on a water bath. As they showed no considerable difference, for the sake of simplicity, only that neutralized with hydrochloric acid is described below. It was observed that all these solutions became acid on evaporation, which was due to the dissociation of the ammonia salt, and probably also of the trimethylamin. The solutions were at first almost colourless, but on long evaporation became brown, and an apparently amorphous substance separated, which collected together in flakes, and under the microscope looked like spherical bacteria, of a slightly reddish colour, and a reed-like structure. The dry residue from evaporation was digested with cold absolute alcohol; the greater part remained undissolved, and proved to be sal ammoniac by its reaction with potash and lime, the odour, the cloud, the platinum salt, and Nessler's test. The alcoholic liquid was heated to boiling, and after boiling a short time allowed to cool; a voluminous precipitate crystallized out, consisting of hydrochlorate of trimethylamin. When

this salt was heated with caustic soda, a sharp, characteristic odour of herring brine was given off; the vapour, when conducted into a colourless flame, imparted to it an intense yellow colour. On treating the salt with cold soda, and holding over it a glass rod dipped in acetic acid, scarcely any reaction was observed, but a rod dipped in hydrochloric acid gave a thick cloud. When chloride of platinum is added to the salt, in a short time a beautiful orange-coloured octahedral precipitate forms. There can be no doubt of the identity of this salt with hydrochlorate of methylamin also present, but attempts to separate it failed. The remainder of the alcoholic liquid, from which the greater part of the trimethylin had crystallized out, was evaporated on a water bath until it began to sputter; then the alcohol was allowed to evaporate, the mass was taken up with water, and shaken in a narrow cylinder with potash and ether. A strong odour of trimethylamin was again given off. After standing a long time, the ethereal stratum was carefully taken off with a pipette, placed in a glass capsule, and left to evaporate spontaneously. The result was a brownish yellow, alkaline liquid, with a peculiar odour, resembling coniin, with a cooling but not bitter taste. A drop placed under the microscope showed, beside the above-mentioned reeds and sickles, also four-sided plates, and similar forms. When moistened with water the filtrate had an alkaline reaction. With chloride of platinum it gave at first no precipitate; on adding alcohol and ether, and allowing it to stand some time, it gave an amorphous, greenish yellow precipitate; with concentrated sulphuric acid and bichromate of potash, a violet colour. With fuming nitric acid, at first a yellow colour; in half a minute it turned green, then a very dark green, with a bluish colour at the edge; in half a minute more it was colourless. With tannic acid, nitrate of silver, Fehling's solution, and chloride of mercury, white precipitates. With chloride of gold, a yellowish white precipitate, soluble in hydrochloric acid. With a one-tenth normal iodine solution, a brown precipitate. With iodine vapours, at first white, then yellow; with bromine itself, a sulphur-yellow precipitate, which became orange and brown. With phospho-tungstic acid, a voluminous yellowish white precipitate. With Nessler's solution, the ammonia reaction. With hydrochloric acid no reaction. Attempts to crystallize it with sulphuric, hydrochloric, or oxalic acid failed. The quantity of the alkaloid described, and to which the author gave the old name of lupulin, was too small to allow of anything more than a nitrogen determination to be made. The alkaloid is volatile, and it is possible that it exists only as liquid and vapour, and that the crystals observed were unessential companions that

accompany it. Its analogy to coniin and nicotin, which act similarly toward fuming nitric acid, favours this supposition.

Other experiments proved that some kinds of hops contain no trimethylamin, and finally, also, that the substances present in hops go into beer.

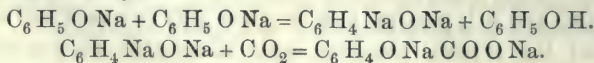
The Preparation of Salicylic Acid and its Physiological Action.
 Professor Kolbe. (*Archiv der Pharm.*, 3rd series, v., 445; *Pharm. Journ.*, 3rd series, v., 421.) Artificial oil of gaultheria, in which the percentage of salicylic methyl ether is very variable, is too costly for the preparation from it of any considerable quantity of salicylic acid. Professor Kolbe experimented, therefore, whether a method formerly described by Sautemann, and himself, for the preparation of artificial salicylic acid ($C_7H_6O_3$) from carboic acid by the joint action of carbonic anhydride and sodium could be simplified and improved so as to allow of salicylic acid being obtained at a more reasonable cost. This object he has succeeded in attaining. After numerous experiments, Professor Kolbe finally adopted the following method:—In a strong crude soda liquor of known strength, is dissolved a sufficiency of previously melted crystals of carboic acid to saturate the caustic soda. The solution is then evaporated in an iron capsule, and by means of stirring brought to a dry powder. The sodium carbolate so obtained is gradually heated in a retort to a temperature of from 220° to $250^\circ C.$, in a continuous current of dry carbonic anhydride. The reaction is ended when at the above-mentioned temperature, no more carboic acid passes over. It might have been expected that, the reaction going forward in this manner, a molecule of carbonic anhydride would be introduced into the molecule of sodium carbolate, and thus a molecule of sodium salicylate be formed:—



This, however, is not the case, only half the sodium carbolate being converted into salicylate. The reaction proceeds according to the following equation:—



In two molecules of sodium carbolate under the influence of carbonic anhydride, an interchange of H and Na takes place; so that on the one hand carboic acid, and on the other side disodic carbolate result; which latter then combines with the carbonic anhydride to form disodic salicylate.



From this salt the salicylic acid is separated by means of hydrochloric acid.

The special physical and chemical properties of salicylic acid are well known, but its physiological action almost not at all. The knowledge that salicylic acid could be so easily prepared from carbolic acid and carbonic anhydride, and that it could be again decomposed by heat into the same bodies, led Prof. Kolbe to think that, similarly to carbolic acid, salicylic acid might stop or entirely prevent fermentative and putrefactive processes, and operate generally as an antiseptic. This expectation has been confirmed. Mustard meal, which in a few minutes after being mixed with warm water gave off a strong smell of mustard oil, formed with water a scentless mixture when a little salicylic acid had been previously added. No fermentation was set up by yeast in a solution of grape sugar to which salicylic acid had been added; whilst in a sugar solution already in fermentation the action stopped after the addition of some salicylic acid. The preservative influence of this acid upon fresh meat is referred to on another page.

The following, among other experiments, in their results illustrate the physiological action of salicylic acid:—

Solution of amygdalin mixed with emulsion of sweet almonds developed no smell of bitter almonds if some salicylic acid were added.

Beer, to which salicylic acid in the proportion of 1 to 1000 was added, was thereby prevented from being spoiled by fungoid growth.

Fresh pure cow's milk, mixed with 0.04 per cent. of salicylic acid, and allowed to stand in an open vessel at a temperature of 18°C ., curdled thirty-six hours later than a similar quantity of milk standing by the side of it, but containing no salicylic acid. The milk remained of a good flavour, the small quantity of salicylic acid present not being perceptible to the palate.

Some fresh urine was divided into two portions, and placed in separate vessels, after some salicylic acid had been added to one portion. The urine containing the acid was on the third day still clear and free from ammoniacal odour, whilst the other portion was far advanced in putrefaction.

Prof. Thiersch has investigated the antiseptic action of this acid specially in relation to surgery. He has found that as a powder, either alone or mixed with starch, it destroys for a long time the fetid odour of cancerous surfaces or uncleansed wounds, without setting up any inflammatory symptoms. A solution of 1 part of

salicylic acid and 3 parts of sodium phosphate in 50 parts of water, promotes the healing of granulating surfaces.

Action of Hydrogen on Nitrate of Silver. M. H. Pellet. (*Journ. de Pharm. et de Chim.*, 4th series, xx., 110.) The contradictory results obtained by different experimenters on this subject are shown by the author to have arisen from the more or less perfect neutrality of the nitrate of silver used.

1. *Action of pure hydrogen on a solution of neutral nitrate of silver in the cold.* The hydrogen was obtained from distilled zinc and perfectly pure hydrochloric acid, and passed through two washbottles, one of which contained soda, the other nitrate of silver, in order to abstract the least traces of acid and of arsenic. Thus prepared, the gas has no action on nitrate of silver (30 grams per litre), even after prolonged contact in the cold. At 80° C. a slight yellowish grey precipitate is obtained, which is only formed during the first few minutes of the experiment, and is more or less abundant in proportion to the strength of the solution.

This fact, which seems to confirm one of the assertions of M. Russell, can be explained on the supposition that neutral nitrate of silver contains a certain quantity of oxide of silver, which is reduced by the action of pure hydrogen. Indeed, the solution separated from the precipitate by filtration is no longer precipitated by hydrogen.

2. *Alkaline solution of nitrate of silver.* Fused nitrate of silver always has a slight alkaline reaction, owing to the presence of a trace of dissolved oxide of silver, which can be reduced by pure hydrogen, both in the cold and by heat. If the liquid is acidified with a few drops of nitric acid, this reaction does not occur. As to the formation of nitrate of silver assumed by M. Russell, the author shows that such an unstable body could not exist in presence of nitric acid, especially at an elevated temperature.

M. Dumas remarks that M. Stas, in making his researches on the atomic weights, had found that at the moment when the dried nitrate of silver reaches the melting point some traces of acid are disengaged, and the salt passes from the neutral to the alkaline state; but the loss being only equal to $\frac{1}{15748}$ th of the total weight, it does not effect the ratio between the nitric acid and the oxide of silver, or between the nitrogen and the silver, which was the principal object M. Stas wished to prove.

Thus, notwithstanding M. Pellet's observations, there is nothing to rectify in the results obtained by M. Stas as to the weight of dried or fused nitrate of silver which a given weight of silver can produce.

Note on the Analysis of Sugar. Dr. J. M. Milne. (*Chem. News*, xxx., 104.) The determination of the fruit sugar in samples of raw sugars is a matter of no difficulty in the hands of a careful manipulator; but there are a few points in detail which are deserving of attention. The usual plan, still in use in some laboratories, of taking a weighed quantity of the sample, dissolving in water, and making up to a given bulk, and using the liquid so obtained for the determination of the fruit sugar, is by no means always to be relied upon. There is no doubt, I think, that many dark-coloured sugars contain other substances (probably albuminous) besides the fruit sugar capable of reducing copper solution, and which must first be separated before correct results can be obtained. The method recommended by Fresenius, of adding lead acetate to the sugar solution till no further precipitate is formed, may be advantageously employed for this purpose. While in some samples the same amount of fruit sugar is found in the solution *before* precipitation with lead as that obtained *after* the addition of that reagent, in others the difference is very marked. The following results, obtained from a sample recently submitted to me for analysis, will illustrate this:—The sugar solution, *without* treatment, gave 4.90 per cent. of fruit sugar, while in a measured quantity of the same solution, *after* precipitation by lead acetate, the amount found was 3.27 per cent.

The following method of procedure answers very well, and is employed by me for *all* sugar samples in which fruit sugar is to be determined:—5 grams of the sample are dissolved in a moderate quantity of water, and the insoluble matter allowed to subside. The supernatant liquid is then carefully poured into a 100-c.c. flask, the insoluble treated with more hot water, and finally collected on a small weighed filter, and the washing continued till the flask is about three quarters full. To the sugar solution a little solution of tribasic acetate of lead is added, the whole well shaken, and the precipitate allowed to subside. The clear liquid is then tested with a drop or two of acetate, and if no further precipitate is produced, the contents of the flask are cooled to the proper temperature, and finally made up to the mark with water, the whole being thoroughly mixed. When the precipitate has subsided, the liquid is passed through a *dry* filter into a clean dry glass, and when sufficient has passed through, is ready for the fruit sugar determination. If it is desired to determine the extractive matters *directly*, the precipitate in the flask is washed several times by decantation, and then placed on the filter (previously weighed), and the washing continued till a

drop of the filtrate no longer gives a precipitate with H_2S ; the filter and contents are then dried as usual. By the above method of treatment, a clear colourless solution is always obtained, which renders the further operations with the copper liquor much easier.

Bismuth Bromide. R. W. Emerson Macivor. (*Chem. News*, xxx., 190.) The combination of metallic bismuth with bromine to form $BiBr_3$, is not, as is the case with antimony and arsenic, attended with the emission of light. The compound is prepared by heating finely powdered bismuth with dry bromine in a hard glass tube closed at the end.

Bismuth bromide, as obtained by this process, is a solid substance of a dark grey colour, fusing at a temperature of 198° to 202° C. to a dark red heat. It is insoluble in carbon disulphide, alcohol, and ether. Hydrochloric acid dissolves it. By heating with nitric acid it is decomposed. It absorbs dry ammonia gas, with formation of a black non-crystalline solid body, possessed of an extremely irritating smell. On exposure to the air it absorbs moisture, and becomes of sulphur-yellow colour. Upon treatment with water it is decomposed, the products of the action being a white amorphous oxybromide and free hydrobromic acid. The oxybromide is insoluble in a solution of tartaric acid, and is decomposed on subjection to a long-continued process of washing with water, with formation of hydrobromic acid and bismuth oxide ($Bi_2O_3 + x Aq.$).

The Preparation and Character of Elaterin. Frederick B. Power. (*Amer. Journ. Pharm.*, Jan., 1875.) A handsome specimen of elaterium was obtained, which a preliminary examination showed to be free from the adulterations sometimes present, and to contain no substances foreign to the drug itself. Fifty grains were exhausted with boiling alcohol, the resulting solution thrown upon a filter, the filter washed with a little boiling alcohol, and the filtrate evaporated by a gentle heat; while still warm, it was poured into a warm dilute solution of potassium hydrate, whereby most of the resin was retained in solution, whilst the elaterin gradually precipitated, upon cooling, in small crystalline crusts or grains.

The amount of elaterium dissolved by the boiling alcohol was 60 per cent., and seven grains of elaterin were obtained, which still required to be purified from the adhering green resin that clings to it with considerable pertinacity, and interferes, both by retarding crystallization and diminishing the beauty and purity of the product.

The impure elaterin was collected, thrown upon a filter, washed with cold water, and redissolved in boiling alcohol. The solution still

possessed a greenish hue, and was agitated with petroleum benzin, which absorbed the resin, and upon the separation and evaporation of the liquids, the elaterin, in beautiful colourless needle-shaped crystals, and the remainder of the resin were obtained separately.

The advantage of benzin for the removal of this resin is very apparent, since the use of ether, which has been previously suggested and employed for the accomplishment of this purpose, is much less preferable in point of economy; it also dissolves a portion of the elaterin, and thereby causes a considerable loss, while by the use of benzin no appreciable amount of elaterin is dissolved. It is believed that, by taking advantage of this fact, treating the elaterium first with water to remove the inert substances soluble therein, treating the residue with boiling alcohol, and subsequently with benzin, the green resin may be completely removed without resorting to the use of the alkaline solution, thereby considerably modifying the usual process and rendering the preparation much more expeditious. The amount of material at the writer's disposal would not admit of any extended experiments in this direction.

A small portion of elaterium was boiled for two hours with dilute sulphuric acid (one part of acid to ten of water), which almost entirely dissolved it, forming a nearly colourless solution, and frothing quite strongly upon agitation, while a few resinous flocks remained insoluble, which, upon separation, were soluble in alcohol, with a yellowish red coloration.

The filtered acid solution, in behaviour to an alkaline solution of cupric oxide and caustic potash, gave evidence of the presence of glucose, although the failure to obtain this result with elaterin induces the writer to believe that *pure elaterin* is not a glucoside, and that in instances where a reduction of the cupric oxide takes place, it may be attributed to the impurities which may be present.

According to Zwenger (*vide* Gmelin's "Handbook of Chemistry," xvii., 365), "Elaterin is insoluble in dilute acids and alkalies, and does not precipitate alcoholic solutions of metallic salts, although aqueous solutions of metallic salts precipitate elaterin from its alcoholic solution in the same manner as water. It dissolves in oil of vitriol with dark red colour, and is precipitated from its solution as a brown substance by water."

The writer observed the following behaviour toward reagents:—If a crystal of elaterin be placed on a porcelain plate with a drop of concentrated sulphuric acid, a deep red colour is instantly produced, which is one of its most delicate tests; if a small fragment of potassium bichromate be then added, it changes to a deep brown,

and ultimately to a light green. As salicin and other substances, however, produce a red coloration with sulphuric acid, this test alone cannot be relied upon, unless attended by other and confirmatory results. Its solution in concentrated sulphuric acid becomes carbonized upon the application of heat. With hydrochloric acid no change of colour takes place, either in the cold or upon heating, and it is apparently insoluble in that liquid.

If a drop of strong nitric acid be added to elaterin upon a porcelain plate, no change of colour takes place, except after standing for several hours, when a pinkish tinge is observed; but upon heating it with that liquid a red coloration is soon produced, with the evolution of nitric oxide vapours, and upon the addition of water white flocks separate.

Elaterin undergoes no change of colour with chlorinated alkalies. An alcoholic solution of elaterin is not precipitated by an alcoholic solution of tannic acid or barium chloride. When heated, it melts, giving off white fumes, which are neutral in their action upon litmus, and burns with a smoky flame, leaving a garnet-coloured, resinous ash.

Chemical Studies of the Peppers of Commerce. A. Wynter Blyth. (*Chem. News.*, xxx., 170.) The peppers examined by the author were obtained from the importers in the berry, and ground by himself. The following are the methods adopted in the examination.

The ash was burnt at a very low temperature in a platinum dish, supporting a chimney to increase the draught; the soluble ash was obtained by boiling the ash with water, filtering, evaporating the soluble ash down in a platinum dish, heating to dull redness, and weighing; the aqueous extract by putting 4 grams of pepper in a large flask with 500 c.c. of water, distilling over 200 c.c., returning these into the flask, when cool, filtering, weighing, and evaporating $\frac{1}{10}$ th; the ammonia, by taking 5 c.c. of the last liquid and distilling it with 50 c.c. of alkaline permanganate by Wanklyn's method; and the alcoholic extract, by treating about 1 gram of the dry pepper with repeated quantities of alcohol, and boiling for some time in a flask connected with a reversed Liebig's condenser.

The author has not yet estimated the piperine in the peppers; indeed, although it can be extracted with comparative ease, the crystallization of the alkaloid and the separation of the resin takes up so much time that the process, however satisfactory, cannot be very attractive to analysts, who have to examine a great number of samples in a short time.

Ash.

	Soluble Ash.	Total Ash.	
		Pepper in the Dry State.	Pepper in its Ordinary Condition.
	Per cent.	Per cent.	Per cent.
Penang	2·2120	4·189	3·8480
Tellicherry	3·3800	5·770	5·3460
Sumatra	2·6260	4·316	3·3340
Malabar	3·4530	5·195	4·6740
Trang	2·5380	4·775	4·2110
A White Pepper, ground by the author, bought at a retail shop	0·5584	1·120	0·7889
Long Pepper	4·4720	8·308	7·1543

The first five peppers give, as the mean of the soluble ash 2·84 per cent. of the dried substance, the two extremes being respectively 3·453 and 2·212. The mean of the total ash of the five peppers is 4·845 per cent., the two extremes being 4·189 and 5·770.

Hygroscopic Moisture.

	Per cent.
Penang	9·531
Tellicherry	12·908
Sumatra	10·103
Trang	11·664
Long Pepper	10·778

It is worthy of note that, as the peppers were finely powdered and kept on the water bath for many hours, besides water, the volatile oil would to a considerable degree be dissipated.

The total loss of weight may be stated generally at 11 per cent.

Alcoholic Extract.

	Grms. per cent. of Dry Pepper.
Penang	7·650
Tellicherry	7·836
Sumatra	6·450
Malabar	6·375
Trang	6·300
The White Pepper before-mentioned	7·650
Long Pepper	2·600

The extract was thoroughly dried before weighing; it may be said to be never less than 6 per cent. in black and white peppers. The small amount of extract yielded by long pepper is noteworthy.

Aqueous Extract.

	The Dry Substance yields to Water. Per cent.
Penang	18.335
Tellicherry	16.500
Sumatra	17.500
Malabar	20.375
Trang	18.175
Long Pepper	16.825

The total ammonia yielded in the manner before mentioned, expressed in percentage:—

100 grms. of—

	NH ₃ .	Nitrogen.
Penang Pepper yield to water .	0.450	= 0.370
Tellicherry " "	0.450	= 0.370
Sumatra " "	0.375	= 0.310
Malabar " "	0.295	= 0.243
Trang " "	0.325	= 0.300
Long " "	0.175	= 0.144

As 100 parts of piperine contain 4.9 of nitrogen, if the nitrogen be considered as belonging to dissolved piperine, the mean of the piperine boiling water takes up, and when cold retains, from the first five peppers is 0.017. The small yield from long pepper is a great distinguishing mark.

Detection of Mineral Acids in Vinegar. M. Strohl. (*Journ. de Pharm. et de Chim.*, xx., 172.) The method proposed by the author is based on the insolubility of oxalate of calcium in dilute acetic and its solubility in dilute mineral acids. Standard solutions of chloride of calcium and of oxalate of ammonia, containing one-fifth of an equivalent of the salt per litre, are employed, half a cubic centimetre of each solution being added to 50 c.c. of vinegar. A turbidity of the mixture, after agitation, shows either the absence of mineral acids or the presence of less than 2.85 grams of hydrochloric acid, 4.40 grams of nitric acid, or 1.70 grams of sulphuric acid per litre of vinegar. A clear mixture, however, indicates that the vinegar contains at least the quantity of mineral acid represented by these figures.

Reaction of Chloral with Permanganate and Hydrate of Potassium. M. Tanret. (*Ber. der deut. Chem. Ges.*, 1874, 1544.) By the action of permanganate of potassium on an aqueous solution of chloral in the presence of hydrate of potassium carbonic oxide is evolved, and chloride, carbonate, and formate of potassium are formed. The same reaction takes place in dilute solutions, and even if borax be used in place of caustic potash. In the author's opinion

chloral suffers a similar decomposition in the blood under the influence of the alkali and the oxygen of the oxyhæmoglobin, in which case the hypnotic effect of chloral would be due to the carbonic oxide produced.

Conversion of Alcohol into Acetate of Ethyl by the Agency of Cryptogamic Life. F. M. Rimmington. (*Pharm. Journ.*, 3rd series, v., 201.) The author's attention was drawn to a bottle of concentrated infusion of quassia made by himself some months previously, which smelt very strongly of acetate of ethyl. The fluid was quite clear and bright, without any sign of fermentation or other change going on. On pouring off the clear liquor, a very thin stratum of sediment appeared at the bottom of the bottle, looking like mud. This, when examined microscopically, proved to consist entirely of unicellular organisms, of a somewhat irregular roundish form, about one-third the size of a yeast cell, and having, like that, one or more nuclei. Besides these cells there were a considerable number of bacteria, or vibrios. The author attributes the fusty smell and taste frequently noticed in quassia wood to the presence of some form of fungoid growth (probably a penicillium), and thinks that some of the spores may have got into the fluid, and thus effected the gradual conversion of the alcohol into acetate of ethyl.

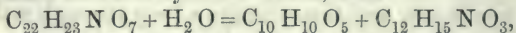
Detection of Amylic Alcohol in Spirit of Wine. C. Betells. (*Ber. der deut. Chem. Ges.*, viii., 72; from *Gazzet. Chim. Ital.*, iv., vol. 10.) Five c.c. of the suspected alcohol are diluted with six or seven volumes of water, and well shaken with 15 to 20 drops of chloroform. The chloroform, when separated and allowed to evaporate spontaneously, leaves the amylic alcohol, which can be recognized by its odour, or by its reaction with H_2SO_4 , and in alkaline acetate. One part of fousel oil may then be detected in two thousand parts of alcohol.

Detection of Veratrine and Morphine. Dr. H. Weppen. (*Archiv der Pharm.*, August, 1874, 112.) While experimenting with Schneider's test for alkaloids (see *Year-Book of Pharmacy* 1874, 212) the author discovered a very delicate and highly characteristic test for veratrine. He found that by adding a few drops of sulphuric acid to a mixture of a minute particle of veratrine with about four times its weight of cane sugar, a pale yellow coloration is produced upon stirring, which, after a short time, changes to dark green, and finally to a beautiful blue. One milligram of the alkaloid is amply sufficient for the production of this blue tint, which lasts for about two hours, and then changes slowly through red to brown. As the reaction depends upon the absorption of water from the air

by the sulphuric acid, it may be accelerated by breathing upon the mixture, or by the cautious addition of a minute drop of water. No other alkaloid produces a similar reaction.

The delicacy of Schneider's test for morphia may be greatly increased by the addition of a drop of bromine water to the mixture of alkaloid, sugar, and sulphuric acid. In this way 0.00001 gram of morphia can be distinctly recognized. The author considers this test as equal in importance, if not superior, to the reaction with ferric chloride, and to Froehde's test (molybdate of sodium dissolved in concentrated sulphuric acid). The success depends much less on the purity of the morphia and the skill of the manipulator than in the case of the ferric chloride test. Froehde's test, though very delicate, is troublesome, as the test solution loses its effect on keeping, and must therefore be freshly prepared when required.

On Narcotine, Cotarnine, and Hydrocotarnine. G. H. Beckett and C. R. A. Wright. (Abstract of a paper read before the Chem. Soc., April 15, 1875; *Chem. News*, xxxi., 81.) The cotarnine employed in the authors' experiments was prepared from narcotine by the action of dilute sulphuric acid and manganese dioxide, and after the separation of the opianic acid precipitating it by strong soda solution. It may be purified by crystallization from benzene, when it has the composition $C_{12}H_{13}NO_3 \cdot H_2O$. The platinum salt is $(C_{12}H_{13}NO_3 \cdot HCl)_2PtCl_4$. The cotarnine was converted into hydrocotarnine by dissolving it in dilute hydrochloric acid, and treating it with granulated zinc. In order to extract the base a large excess of ammonia was added, and the solution agitated with ether; this takes up the hydrocotarnine, and deposits it on evaporation in fine prisms an inch in length. These crystals have the composition $2(C_{12}H_{15}NO_3 \cdot H_2O)$. It forms a crystalline hydrochloride, $C_{12}H_{15}NO_3 \cdot HCl \cdot H_2O$. Hydrocotarnine is always produced in the preparation of cotarnine from narcotine in the manner above described. The action of manganese dioxide and sulphuric acid on hydrocotarnine converts it into cotarnine, but much tarry matter is formed at the same time; narcotine does not take up hydrogen when treated with reducing agents, and when boiled with baryta water it yields meconin, but no opianic acid; heated with water to 150° it is decomposed, meconin and hydrocotarnine being found amongst the products. From these results it seems probable that in the preparation of cotarnine from narcotine the latter first splits up into opianic acid and hydrocotarnine, thus:—



and that the hydrocotarnine is then oxidised to cotarnine.

The physiological action of cotarnine and hydrocotarnine has been examined by Dr. F. Pierce, who finds that whilst the former, in doses up to 0·5 gram, does not produce the slightest effect, hydrocotarnine produces severe epileptiform convulsions, great muscular prostration, and salivation.

Determination of Glucose in presence of Sugar. P. Champion and H. Pellet. (*Comptes Rendus*, January 18, 1875; *Chem. News*, xxxi., 84.) To determine glucose in presence of excess of sugar, the authors add an excess of Possoz's liquid (a modification of Fehling's, in which carbonate of soda is used instead of caustic), and keep it at 70° in the water bath for three quarters of an hour. Collect on a filter the suboxide formed and wash it; then place the filter, still damp, in a capsule, and add dilute hydrochloric acid, which converts the suboxide of copper into subchloride. The liquid becomes coloured, and the copper passes into the state of bichloride of copper of a greenish yellow, when it is titrated with chloride of tin. The ebullition is maintained till all the chlorine products have been expelled. This is ascertained by fixing to the mouth of the flask containing the solution a tube bent twice, and plunged into water coloured blue with sulphate of indigo. In this manner a few milligrams of glucose may be determined in 100 grams of sugar.

Oil of Wormseed and Cymene. A. Faust and J. Homeyer. (*Ber. deutsch. Chem. Ges.*, 1874, 1427.) The principal constituent of the commercial oil of wormseed is an oil boiling at 173° to 174° and containing 75·5 per cent. of carbon and 11·5 per cent. of hydrogen; its sp. gr. at 20° is 0·913. Besides this the raw oil contains a small quantity of resinoid substance.

The authors prepared cymene by the action of phosphorus sulphide on oil of wormseed, as recommended by Graepe. The product when shaken successively with solution of potash, water, and concentrated sulphuric acid, and then repeatedly rectified from sodium, was found to boil at 174° to 176°, to possess the odour of cymol, and to yield paratoluic acid upon oxidation by dilute nitric acid. The combustion gave the following results:—

Calculated for Cymene.	Cymol.	Found.	Found by Völkel.
C ₁₀ = 88·23	C ₁₀ = 89·55	C = 89·49	C = 88·70 88·79
H ₁₆ = 11·77	H ₁₄ = 10·45	H = 11·09	H = 11·14 11·13

showing that Völkel's analyses also agree better with the formula C₁₀H₁₄ than with C₁₀H₁₆.

The authors have also prepared and examined the corresponding

sulpho-acid and its barium-salt, and obtained results, which leave no doubt as to the identity of this cymene with cymol.

Assay of Commercial Sulphate of Soda. L. L. de Koninck. (*Revue Universelle des Mines*, March and April, 1874; *Chem. News*, xxx., 157.) Commercial sulphate of soda may contain besides the normal salt, bisulphate of soda, salts of potash, sulphates of iron, alumina, lime, and magnesia, common salt, water, and insoluble matters. The salts of potash are considered as salts of soda. Free acid includes half the acid of the bisulphate of soda, and all combined with alumina and iron, the whole calculated as SO_3 . The sulphate of soda is determined by difference.

Insoluble Matter.—Weigh 50 grams of the sample, dissolve in 600 to 700 c.c. of distilled water, and filter into a flask marked at one litre. The insoluble matter remaining on the filter is washed into the flask, dried, and weighed after incineration. We do not in this manner obtain the full amount of the insoluble matters, since some of them are combustible, and are lost during ignition.

Free Acid.—The filtrate is made up to one litre, and well stirred so as to be homogeneous. By the aid of a pipette 300 c.c. are taken, placed in a beaker, and titrated with standard alkali in the usual manner.

Alumina and Oxide of Iron.—200 c.c. of the filtrate are taken, and mixed with bromine-water to peroxidise the iron. Precipitate with ammonia, and weigh the mixed deposit of alumina and ferric oxide in the usual manner.

Sulphate of Lime.—To the filtrate from the alumina and oxide of iron, oxalate of ammonia is added. The precipitate is collected on a filter, washed, ignited, treated with a few drops of sulphuric acid, diluted with an equal volume of water, ignited again, and weighed as sulphate.

Sulphate of Magnesia.—To the liquid freed from lime, ammonio-phosphate of soda is added. The precipitate formed is converted by ignition into pyrophosphate of magnesia, one part of which represents 1.08 of sulphate. Chloride of sodium is determined by titration in the well-known manner with nitrate of silver, using chromate of potash as indicator. Water cannot be determined directly, for before the water is expelled the bisulphate of soda reacts upon the chloride of sodium. The sample is therefore heated to fusion, and the known amount of free acid deducted from the loss. A correction is still required on account of the loss of hydrochloric acid. For every 117 parts of chloride decomposed by fusion we must add to the loss 25 parts. To find the quantity of

chloride thus decomposed, we dissolve the sample after fusion, and redetermine the chlorine.

Qualitative Detection of Arsenic in Organic and Inorganic Matter. MM. Mayençon and Bergeret. (*Comptes Rendus; Chem. News*, xxx., 104.) The authors place pure zinc in a small flask containing distilled water, acidulated with pure sulphuric acid, and close its neck imperfectly with cotton-wool, to prevent drops of the liquid being thrown upon the test paper, which is simply tissue paper, moistened with a solution of bichloride of mercury, and used before it dries. If this paper is exposed to pure hydrogen, no change appears; but if any arsenical compound is placed in the flask, a lemon-yellow spot appears, which gradually deepens to a pale yellowish brown. Antimoniuretted hydrogen produces a brownish grey spot, quite distinct from the arsenical coloration. The reaction is exceedingly delicate.

Process for Determining Tannin in Wines. E. J. Maumené. (*Bulletin de la Soc. Chim. de Paris*, July 5th, 1874; *Chem. News*, xxx., 188.) A known volume of the wine is measured out, and alcohol is added in moderate quantity. An excess of solution of caustic baryta is added, then a little sal-ammoniac. The mixture is heated for some minutes, cooled, and the precipitate washed first with concentrated alcohol and then with cold water. The tannic precipitate is then treated with dilute boiling sulphuric acid, and the tannin in the solution is determined by permanganate of potash.

Volumetric Estimation of Iodide of Potassium. M. Personne. (*Répertoire de Pharmacie*, ii., 737.) The author's method, which has been favourably received by the French Academy of Medicine, is based upon the fact that bichloride of mercury, when slowly added to a solution of iodide of potassium, causes the formation of a soluble double salt, and does not produce a permanent precipitate of red iodide of mercury until one half of the iodide of potassium has been decomposed by the bichloride. Thus, if to a solution of iodide of potassium, containing two tenths of an equivalent, or 33·20 grams per litre, ten cubic centimetres of a solution of bichloride of mercury, containing one tenth of an equivalent, or 13·55 grams per litre be added, a clear mixture is obtained, in which the addition of one further drop of the mercurial solution produces a red precipitate.

The test solution is prepared by dissolving 13·55 grams of bichloride of mercury, and 8 or 10 grams of chloride of sodium, in about 400 grams of water, and then diluting the solution to the bulk of one litre. Another solution is made containing in one litre,

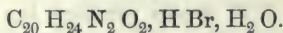
33·20 grams of the iodide of potassium to be tested. Of this last solution, 10 c.c. are placed in a beaker, and a mercurial solution is added drop by drop from a burette, until the red precipitate formed after every addition ceases to disappear upon stirring.

The presence of carbonate, chloride, or bromide of potassium does not interfere with the application of this test.

Neutral Hydrobromate of Quinia. M. Boille. (*Journ. de Pharm. et de Chim.*, xx., 181; *Pharm. Journ.*, 3rd series, v., 303.) Two years since, the author brought under the notice of the French Academy of Medicine an acid hydrobromate of quinia. Further investigation of its properties has led him to the preparation of the neutral hydrobromate, which he considers to be far superior to the officinal quinia sulphate, both as to solubility in water and richness in quinia. The neutral hydrobromate is prepared by double decomposition of bromide of barium and neutral sulphate of quinia, and is thus easily obtained pure and free from chloride; the great solubility of bromide of barium in alcohol facilitating the removal of any chloride which is insoluble. The two salts are dissolved separately in alcohol, and the solutions filtered. The neutral sulphate of quinia solution is gradually added in slight excess to the bromide of barium solution, until a precipitate ceases to form. The solutions, diluted with water, are distilled to recover the alcohol, afterwards filtered, to separate the sulphate of quinia which has been precipitated by the water, and then concentrated sufficiently to induce rapid crystallization. The addition of water is indispensable for the concentration and crystallization; the hydrobromate, being soluble in alcohol in all proportions, redissolves as the alcoholic liquor is concentrated.

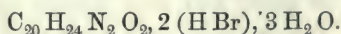
Neutral hydrobromate of quinia is also obtained easily by dissolving hydrate of quinia in weak hydrobromic acid. Upon cooling, the salt forms beautiful nacreous crystals; redissolved several times in water, it crystallizes in the basic state.

Neutral hydrobromate of quinia has for its formula:—



	Experiment.	Theory.
Water . . .	4·80 . . .	4·25
Bromine . . .	18·26 . . .	18·91
Quinia . . .	75·20 . . .	76·59

The formula for acid hydrobromate of quinia is:—



	Theory.	Experiment.
Water . . .	10.00 . . .	10.00
Bromine . . .	24.62 . . .	28.84
Quinia . . .	60.00 . . .	50.60

The crystallization of the acid hydrobromate of quinia in well-defined regular facets distinguishes it from the hydrochlorates, which crystallize in silky filaments. The former crystals do not become resinous in the presence of an excess of hydrobromic acid, and are prepared by dissolving quinia in an excess of hydrobromic acid; they are soluble in water and alcohol.

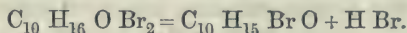
The solubility of neutral hydrobromate of quinia is stated by the author to be very remarkable, it being soluble in five times its weight of water. This solubility of the neutral salt he considers to be a property of high therapeutic value, as it should be better tolerated than the neutral sulphate, and more active, being more quickly absorbed. More soluble and more rich in quinia than the acid sulphate, he thinks it might replace the latter advantageously in various liquid preparations, without causing the least irritation of the mucous membrane. Further, it combines the properties of bromine and the salts of quinia, whilst its easy absorption allows of its internal administration. On the whole, M. Boille considers that its properties give it a great superiority over all other compounds of quinia.

Monobromated Camphor. M. Gault. (*L'Union Pharmaceutique*, xv., 266; *Pharm. Journ.*, 3rd series, v., 321.) The therapeutic application of monobromated camphor by Dr. Bourneville, has induced the author to work out an improved method for its preparation.

The operation may be divided into four stages: (1) Formation of bibromated camphor; (2) Reaction, giving rise to monobromated camphor, at a temperature below 100° C.; (3) Purification by washings and crystallizations; (4) Utilisation of a secondary product (Swarts's hydrobromate of camphor bromide).

The formation of bibromated camphor ($C_{10}H_{16}OBr_2$) presents no difficulty; it is effected by the simple addition of bromine to camphor. Maisch uses a small quantity of alcohol, but this the author thinks unnecessary. The camphor, previously powdered, is introduced into a retort about ten times the capacity of the volume of bibromated camphor to be formed, and upon this powder the bromine is poured in a thin stream, with constant stirring, until the camphor is all liquefied; under these conditions approximately two molecules of bromine to one of camphor will be employed.

The clearness of the reaction, which is indicated by the liquefaction, dispenses with the necessity of weighing, whilst a slight excess of one or other of the ingredients has not been found to influence the final product. The conversion of the bibromated camphor into monobromated camphor is effected in the same retort, to which is adapted a long and large abductor tube, dipping into an alkaline solution; this has for its object the absorption of all inconvenient vapours. The retort is placed in a water bath, which is heated to ebullition. The reaction quickly manifests itself, and is accompanied by the disengagement of torrents of hydrobromic acid gas, and some vapours of undecomposed camphor and bromine. The dark brown liquid acquires an amber colour, and the evolution of gas slackens suddenly. The reaction, due to a very simple substitution, is represented by the formula:—



The arrangement of the apparatus and the tumultuous disengagement of gas did not permit the author to recognize the exact temperature of the reaction; but he is certain that it was between 80° and 90° C., and did not reach 132° C. That temperature, therefore, mentioned by Maisch, he considers to be exaggerated. He insists upon attention to this latter point, because he is convinced, by comparison with other processes, that the quantity of oily product is thus notably diminished, and that the purification of the monobromated camphor is rendered more easy. The amber liquid which remains in the retort solidifies on cooling, and forms a friable and slightly citrine mass. If the contents of the retort be thrown into a capsule, the disengagement of hydrobromic acid continues during several hours, and the mass presents an energetic reaction. But if the same liquid be thrown into boiling distilled water, and the ebullition be continued some time in the open air, the hydrobromic acid gas is nearly entirely removed from the mass, and the last traces of bromine vapour by which it might be contaminated are driven off. The product is then nearly white.

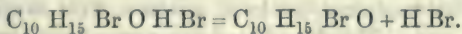
In connection with this point the author remarks that the volatilization of monobromated camphor by the intervention of vapour of water, alluded to by Maisch, is not so notable as to counteract the advantage of this first stage of purification. To obtain the product colourless and crystalline, decolorisation by animal black or repeated crystallizations may be adopted. In either case the citrine mass of crude monobromated camphor is treated with boiling 90° to 95° alcohol, and the filtered liquor left to crystal-

lize. The author prefers the method of repeated crystallizations. The crystals are dried in the open air upon unsized paper.

The monobromated camphor so obtained consists of tufts of crystalline acicular colourless prisms, with a rectangular base, which attain a length of three centimetres. The crystals are hard, and crackle between the teeth. They have an odour both of camphor and turpentine, less penetrating than camphor, but also less fugitive. Their slightly bitter taste resembles that of camphor or Venice turpentine.

Monobromated camphor is insoluble in water, and soluble in alcohol, fixed and volatile oils, ether, carbon bisulphide, chloroform, etc. Its melting point, according to Maisch, is $67^{\circ}\text{C}.$; according to Wurtz, between 76° and $77^{\circ}\text{C}.$; the author found it to range between 69° and $70^{\circ}\text{C}.$, solidification commencing below 69° . It boils at $274^{\circ}\text{C}.$, with partial decomposition. Heated to $100^{\circ}\text{C}.$, it should not give a sublimate of camphor; calcined with potash, it leaves as a residue a mixture of bromine and carbonate of potassium.

In the mother liquor, and upon the crystals of the second and third formation, is found the oily substance that has been before spoken of as Swarts's hydrobromate of camphor bromide; the utilisation of this product forms the fourth stage of the operation. It might be almost entirely removed by pressing the crystals between filtering paper; but this method, besides being imperfect, would cause considerable loss. With the same object the author tried the action of alkalies, in the hope of fixing the hydrobromic acid of the compound; but the result did not answer his expectations. He prefers to follow the indications of Swarts, who recommends to effect the dissociation of the hydrobromate by a temperature of $260^{\circ}\text{C}.$, according to the following equation:—



In order to avoid, however, the carbonization of a considerable portion of the product, the author operates at a temperature below $260^{\circ}\text{C}.$, for between 200° and $220^{\circ}\text{C}.$ the disengagement of hydrobromic acid is abundant, and the decomposition according to the equation is nearly complete.

The high temperature of $200^{\circ}\text{C}.$ to $260^{\circ}\text{C}.$ is thus only used by the author for the utilisation of a secondary product, whilst in Perkin's process all the dibromated product is submitted directly to a temperature which decomposes a considerable proportion, and to a succeeding distillation more injurious than useful. The oily

body, after being heated to between 200°C . and 220°C ., forms a black viscous mass, which upon cooling becomes solid and brittle. Treated with boiling alcohol this mass yields, after filtration, fresh colourless crystals of monobromated camphor. The author reports that, operating thus, he obtained about 250 grains of perfectly pure monobromated camphor in a single operation.

Physiological Action.—Dr. Bourneville has communicated to the Société de Biologie the result of experiments made upon guinea-pigs, rabbits, and cats with this new medicament. He attributes to monobromated camphor the following physiological properties:—

(1.) It diminishes the number of beats of the heart, and determines a contraction of the auricular vessels.

(2.) It diminishes the number of inspirations.

(3.) It lowers the temperature in a regular manner. In mortal cases this abatement augments until death. When recovery takes place the lowering of the temperature is followed by a return to the initial degree; but this recovery requires a longer time than that occupied in the diminution.

(4.) It possesses incontestible hypnotic properties, and appears to act principally upon the cerebral system.

(5.) The system does not appear to become tolerant of this medicine, and its prolonged use (at least with guinea-pigs) brings on a rapid emaciation.

Dr. Bourneville, therefore, considers the use of monobromated camphor is indicated when it is desired to produce an energetic sedative effect upon the circulatory system, and especially upon the cerebro-spinal nervous system. It is one of the most clearly-defined antispasmodics.

Administration.—According to Dr. Bourneville, monobromated camphor may be administered in the form of pills, with conserve of roses as an excipient, or in a mixture with mucilage of gum arabic and syrup. The dose for adults varies from twelve to about thirty centigrams daily. Dr. Bourneville uses pills containing each ten centigrams of monobromide, and of these he gives as many as twelve a day. When administration by the mouth is impracticable, he employs the following solution in subcutaneous injection:—

Monobromated Camphor	. . .	3 grains.
Alcohol	. . .	35 ..
Glycerin	. . .	22 ..

The Employment of Coal Oils in the Preparation of Alkaloids, etc. G. Boiraux and E. Seger. (*Répertoire de Pharmacie*, ii.,

377.) The heavy duties charged upon alcohol in France almost precludes its use in the manufacture of alkaloids in that country. This fact induced the authors to carry out a series of experiments with the object of preparing these substances without the intervention of alcohol. In the course of these experiments they found that the oils obtained by the destructive distillation of coal are good solvents of a great number of alkaloids, and that they have the advantage over alcohol of having but little action upon the extractive, and yielding at once almost colourless solutions, thus rendering unnecessary the repeated recrystallizations and treatment with animal charcoal.

The solvents employed in the investigations were:—(1) The oils boiling between 50° and 100° C., and known in commerce as benzole; (2) that portion of the oil which passes over between 80° and 120° ; (3) the preceding, with the addition of 5 per cent. of carbolic acid.

In a full report of their labours, the authors show that the following alkaloids, etc., may be profitably obtained by their processes: *atropine*, *santonin*, *veratrine*, *delphinine*, *strychnine*, *brucine*, *cantharidin*, *quinine*, *cinchonine*, *narcotine*, *aconitine*, and *coumarine*. For the details of these processes we must refer our readers to the original article, of which a translation has appeared in the *Pharm. Journ.*, v., 642, 643, 661, 662.

Oil of Eucalyptus. A. Faust and J. Homeyer. (*Ber. deutsch. Chem. Ges.*, 1874, 1429, 1430.) In a previous communication the authors have shown that the so-called eucalyptol of Cloëz consists mainly of a terpene and cymol, and that besides these it contains two other fluid substances, boiling at about 156° and 200° respectively. They have now subjected these two substances to a closer examination. One, which is present in very small quantities, is a terpene boiling at 150° to 151° ; the other is a colourless oily liquid, insoluble in caustic potash, and boiling at 216° to 218° . The combustion of this substance gave the following figures, which leaves some doubt as to its formula:—

Required for.		Found.	
$C_{10} = 80.00$	$C_{10} = 78.9$	$C = 79.56$	79.15
$H_{14} = 9.33$	$H_{16} = 10.5$	$H = 9.95$	10.32
O	O		

As it is insoluble in caustic potash, it is probably not an oxycymol but a camphor-like substance. On heating and subsequent distillation with phosphorus sulphide, it forms cymol, which, after further purification, boils at 174° to 175° , and has the following composition:—

Required for.	Found.
$C_{10} = 89.55$	89.28
$H_{14} = 10.45$	10.87

The following, therefore, are the constituents of the essential oil of eucalyptus globulus:—

1. A terpene boiling at 150° to 151° .
2. Another terpene having a higher boiling point.
3. Cymol.

4. A substance containing oxygen, which is closely allied to cymol. The terpene boiling at 172° to 175° and the cymol form the principal constituents, amounting to about nine-tenths of the oil; the relative proportion of this terpene to the cymol is two to one.

Croton Chloral. Dr. R. Engel. (*Journ. de Pharm. et de Chim.*, 4th series, xx., 278; *Pharm. Journ.*, 3rd series, v., 341.) Notwithstanding that since Dr. Liebreich first brought croton chloral under the notice of the medical profession, it has been the subject of numerous physiological experiments, very little is generally known of it, especially in a chemical point of view. The object of the author in this paper, therefore, has been to describe the preparation, and the chemical, physiological, and therapeutic properties of this substance, which is now prepared on a large scale in Berlin.

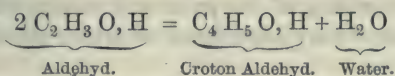
Constitution.—Ordinary chloral is an aldehyd; it is the hydride of trichloracetyl, C_2Cl_3OH . Croton chloral is the hydride of trichlorocrotonyl, $C_4H_2Cl_3OH$, or the aldehyd of crotonic acid, C_4H_5O, OH , in the radical of which three atoms of hydrogen have been replaced by three atoms of chlorine.

Preparation.—Krämer and Pinner were the first to obtain croton chloral by passing a current of chlorine into aldehyd during twenty-four hours. The action is very energetic at the commencement of the operation, so that it is necessary to surround the vessel containing the aldehyd with a refrigerating mixture, and it is only towards the end that the temperature is raised to $100^{\circ}C$. During all the time of the action of the chlorine upon the aldehyd, large quantities of hydrochloric acid are disengaged. The product obtained is submitted to fractional distillation, and a liquid is thus isolated passing over between 163° and $165^{\circ}C$., which is croton chloral.

Wurtz had previously studied the action of chlorine upon aldehyd, and had indicated among other products of the reaction, chloride of acetyl, and had shown that ordinary chloral is not produced; but the formation of croton chloral escaped him. The

reason was that Wurtz caused chlorine in excess to act upon aldehyd, whilst Krämer and Pinner passed a current of chlorine into the aldehyd until it was no longer absorbed.

The production of croton chloral under these conditions is easily understood, since Kekulé has shown that acetic aldehyd, under the influence of various saline solutions, and more easily still under that of hydrochloric acid, is condensed, with the elimination of water into croton aldehyd :—

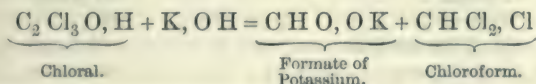


Further, aldehyd, under the combined action of heat and a little hydrochloric acid, may even be combined with other aldehyds, with the elimination of water, and new compounds be thus engendered, which are themselves aldehyds.

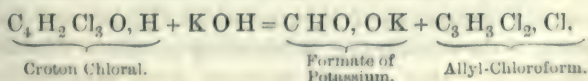
In the action of chlorine upon acetic aldehyd a substitution is commenced in the latter, which results in the formation of hydrochloric acid. This acid determines, as has just been seen, the formation of croton aldehyd ; upon which the substitutive action of the chlorine then goes on. The formation of croton chloral is thus readily explained.

Physical and Chemical Properties.—Anhydrous croton chloral is a colourless oleaginous liquid, having a peculiar odour, recalling that of ordinary chloral. It is insoluble in water, but, like ordinary chloral, it combines with water to form a crystallized hydrate. The hydrate of croton-chloral crystallizes in white nacreous spangles. It is slightly soluble in cold water, more freely soluble in warm water, and extremely soluble in alcohol (Krämer and Pinner). It dissolves more readily in glycerin than in water (J. Worms).

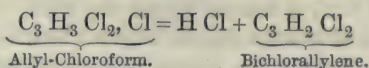
It is known that ordinary chloral is decomposed under the influence of caustic potash into chloroform and formate of potassium :—



Under the same influence croton chloral breaks up into allyl-chloroform and formate of potassium :—



But allyl-chloroform is excessively unstable, and decomposes rapidly into hydrochloric acid and bichlorallylene :—



Physiological and Therapeutic Properties.—According to Liebreich, croton chloral, administered internally, rapidly produces slumber similarly to ordinary chloral, but without its use being followed, as is the latter, by lowering of the pulse and respiration. Even after the administration of very high doses of croton chloral the pulse is not reduced.

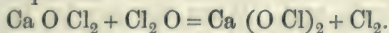
The author thinks that it is not to the first product of decomposition (allyl-chloroform) that hypnotism is due. Allyl-chloroform, being very unstable, breaks up immediately, and he thinks therefore the action of croton chloral should be attributed to bichlorallylene. Moreover, Liebreich has found that bichlorallylene, when administered to animals, does not reduce the circulation or respiration. Comparing the effects of chloroform and chloral on the one hand, and bichloride of ethylene and bichlorallylene on the other, he considers himself justified in asserting that whilst the trichlorinated substances act upon the brain, spinal cord, and heart, the chlorinated substances act upon the brain and spinal cord. In none of his experiments has Liebreich recognized any hurtful effects on the stomach or any other organs; and he reports that he has employed it very successfully in cases of facial neuralgia, the pain ceasing frequently before sleep is produced. Jules Worms, however, asserts that croton chloral is not so generally tolerated as chloral; and Georges Gay says that its narcotic action is more uncertain.

Croton chloral is hypnotic in doses of from half to one gram. It may be administered in solution in water, or in glycerin. The following is the formula employed by Jules Worms :—

Croton Chloral	1 gram.
Glycerin	60 grams.
Water	60 „
Oil of Peppermint	3 drops.
Simple Syrup	25 grams.

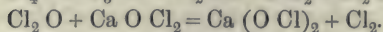
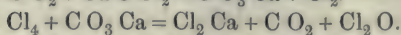
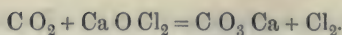
Chemical Constitution of Bleaching Powder. W. Wolters. (*Journ. Pract. Chem.*, 2nd series, x., 128–148; *Journ. Chem. Soc.*, 2nd series, xiii., 236.) The author discovered a method of detecting hypochlorous acid in presence of chlorine, which Göpner used for the investigation of the constitution of bleaching powder. The method is based on the fact that metallic mercury gives with the former an

oxychloride, with the latter mercurious chloride. The attacks which were made on Göpner's results induced the author to make further experiments on the products of decomposition of bleaching powder, with the following results. The constant occurrence of chlorine and hypochlorous acid in the products obtained by the action of acids on bleaching powder is due to the rapid decomposition of the products first obtained. Experiments on the influence of chlorine on calcium sulphate, carbonate, etc., lead to the conclusion that the reaction is sufficiently active to explain the occurrence of the considerable quantities of hypochlorous acid, obtained in the decomposition of bleaching powder. Owing to this reaction of chlorine on the salts of the alkalies and alkaline earths, together with that of hypochlorous acid upon the hypochlorites, the chemical constitution of bleaching powder cannot be discovered from its decomposition by acids. Further experiments showed a difference in the behaviour of the bleaching compound of lime, and those of the alkalies. Alkaline solutions of the former give off chlorine when heated, while those of the latter do not. The former is also more strongly acted upon by carbonic acid than the latter. If the alkali bleaching compound is K O Cl , and the lime compound, Ca O Cl_2 , it is probable that the hypochlorous acid (which can expel carbonic acid from its compounds) produces chlorine from bleaching powder, according to the equation—

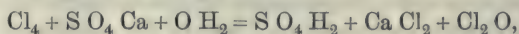


If bleaching powder consisted only of calcium hypochlorite, chlorine could be evolved by the action of hypochlorous acid only, if the oxygen went to the formation of chlorous acid or chloric acid. When hypochlorous acid and chloride of lime were brought together in dilute solution, rise of temperature being guarded against, calcium chlorite and chlorate were slowly produced, and the existence of the compound Ca O Cl_2 in the solution of chloride of lime was shown in the course of the experiment.

By experiments on the changes which a solution of bleaching powder undergoes in presence of free chlorine and carbonate, phosphate, etc., of calcium, it was proved that a compound which was attacked by carbonic acid with difficulty, was gradually formed in the solution from one which carbonic acid easily acts upon. The *rationale* of the change is as follows:—Chlorine is set free from Ca O Cl_2 by the carbonic acid of the air, and then reacts upon the calcium carbonate, with formation of calcium chloride, hypochlorous acid, and carbonic acid; and these last two again react upon Ca O Cl_2 , thus:—



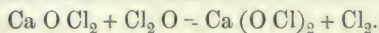
If free chlorine and sulphate, phosphate, etc., of calcium is present, or if the chlorine is set free by sulphuric acid, phosphoric acid, etc., the following reaction takes place:—



and then again the hypochlorous acid reacts upon the Ca O Cl_2 . The final result of all these reactions is that Ca (O Cl)_2 is produced from Ca O Cl_2 . The chloride of calcium so constantly present in specimens of bleaching powder arises especially from the hydrochloric acid mixed with the chlorine. The caustic lime is due to the envelope of calcium chloride, as suggested by Bolley, and also of the compound, Ca O Cl_2 , both of which protect particles of lime from the action of the chlorine.

In a second series of experiments (*Journ. Chem. Soc.*, 2nd series, xiii., 422) the author has endeavoured to elicit the constitution of bleaching powder by distilling it with an acid, by distilling it alone, and by determining the amount of chlorine and hypochlorous acid by shaking with mercury after treatment with carbonic acid. No concordant results were obtained by distilling with sulphuric, nitric, or phosphoric acid. When the powder is distilled alone, water holding chlorine and a little hypochlorous acid in solution passes over.

When a solution of chloride of soda or potash was distilled, a current of carbonic acid being passed through the liquid in the retort, the distillate consisted of hypochlorous acid and chlorine. A solution of chloride of lime of the same strength gave a distillate much richer in those substances. If the difference between the distillates is to be explained by the supposition that chloride of soda is expressed by the formula Na Cl O , while chloride of lime is $\text{Ca Cl}_2 \text{ O}$, it is not improbable that hypochlorous acid is not so weak as is generally supposed. To test this, some hypochlorous acid was prepared in the usual manner, and added to a solution of sodium carbonate. Carbonic acid was evolved copiously, while chlorine caused only a few bubbles. The author assumes that as hypochlorous acid liberates carbonic acid from its salts, and as carbonic acid liberates chlorine from bleaching powder, the action of hypochlorous acid should be expressed by the equation—



If, on the other hand, chloride of lime contains the compound $\text{Ca}(\text{OCl})_2$, the action of hypochlorous acid should give rise to potassium chlorate.

The estimation of chlorine and hypochlorous acid in the same solution was conducted as follows. Mercuric oxide or oxychloride is transformed into mercuric oxalate by oxalic acid, but mercuric chloride is not attacked. As mercuric oxalate is insoluble in water, it can be separated from the chloride by filtration, and the oxalic acid determined with potassium permanganate in the usual manner. Every molecule of oxalic acid represents two atoms of chlorine.

On shaking 30 c.c. of hypochlorous acid and 15 c.c. of a solution of bleaching powder saturated with chlorine, separately, with mercury, and determining their strength, and then shaking them together before estimating the amount of hypochlorous acid and chlorine, hardly any chloric acid was formed, and nearly the quantity of chlorine demanded by the equation was obtained. This shows conclusively that the compound CaCl_2O really exists both in solid bleaching powder and also in its solution.

In order to ascertain if an aqueous solution of bleaching powder gradually decomposes into calcium hypochlorite and chloride, carbonic acid was passed through a solution after it had been treated with carbonic acid, calcium sulphate, and phosphate, and with free chlorine; it was found that on standing, and also after it had been treated with these substances, a compound easily decomposed by carbonic acid was transformed into one not attacked by that reagent. The decomposable compound appears to be CaOCl_2 ; the undecomposable, $\text{Ca}(\text{OCl})_2$.

Action of Iodine on Arsenious Acid. M. Wegner. (*Ann. Chem.*, clxxiv., 129-133; *Journ. Chem. Soc.*, 2nd series, xiii., 133.) According to Zinno, an iodarsenic acid is formed by adding iodine to a hot aqueous solution of arsenious acid, as long as it dissolves without colour, and evaporating the solution to crystallization. The crystals thus obtained are, however, nothing but arsenious oxide containing a trace of hydriodic acid. When iodine is dissolved in a hot solution of arsenious acid, the latter is oxidised, and arsenic acid and hydriodic acid are formed, which act on each other again when the solution is concentrated, free iodine and arsenious acid being regenerated.

Volumetric Estimation of Copper. P. Lagrange. (*Comptes Rendus*, lxxix., 770.) The copper is precipitated from its acid solution by caustic potash or soda, and the precipitated hydrate converted into the double tartrate of copper and sodium, or the

corresponding potassium compound. A standard solution of glucose is then added until the copper is completely precipitated as cuprous oxide.

Chlorinated Alkalies as a Test for Morphia and other Proximate Principles. H. S. Wellcome. (*Amer. Pharm. Journ.*, 4th series, iv., 305.) The reaction of chlorine and chlorinated lime with morphia has been repeatedly alluded to (Duflos, Braconnot, and others), but seems to have never been fully investigated. From continued experiments the author has become convinced that the subject deserves more attention than it has hitherto received.

It is extremely delicate and very characteristic. Solution of chlorinated soda and other alkaline solutions of chlorine give the same reaction. As a reagent, the following solution has been found very convenient; it is made by adding two ounces of fresh chlorinated lime to a pint of water, and, after standing a few hours, decanting the clear solution.

Morphia, in powder, gives a deep red colour with a drop of this solution.

With a solution of one grain of morphia in one thousand grains of water, it gives a bright red colour; and a drop of the mixture evaporated on a porcelain plate leaves a deep red ring. On the addition of ammonia, or any other strong alkali, the solution becomes dark-brown.

It gives a distinct orange colour in solution of one grain of morphia in five thousand of water, and with care may be made to show plainly in solution of one grain in ten thousand. Excess of the chlorine decolourises these solutions, and the orange colour cannot be restored. Excess of an acid decolourises them, but the colour reappears on adding excess of an alkali. These reactions are the same in the presence of all other alkaloids with which the author has experimented.

When a few drops of chlorine water are added to morphia in powder, and, after solution, a drop or two of ammonia, beautiful red star-like spangles will form. This test is best performed on a porcelain plate or crucible cover.

Alkaline solution of chlorine also gives a red colour with phloridzin, either in powder or solution, and this too is decolourised by excess and by acids, and restored by excess of alkali; but as this substance is very rarely used in medicine, the reaction seems to be of very little importance. In powder, it is coloured brown-black by strong nitric acid, by which behaviour it is readily distinguished from morphia.

Colchicine gives a yellow colour with the chlorinated lime solution, but so slight that it is of little importance.

Aloin gives a dark red colour, part of which is due to the alkali ; the colour is only partially destroyed by excess of an acid.

The only other alkaloid that gives a similar reaction with chlorine is brucine.

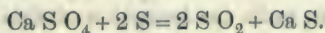
Any solution of chlorine added to an acid solution of brucine gives a bright red colour. Alkaline solutions of chlorine do not react with the powder ; but if a drop of an acid be first added, a deep red colour is produced.

Excess of chlorine decolourises both, and the colour cannot be restored. Strong acids and alkalies cause no changes ; thereby it is readily distinguished from morphia, and the reaction becomes a characteristic and delicate test for brucine.

While conducting these experiments the author has had access to Prof. Maisch's and other extensive collections of alkaloids and proximate principles, and has found all others, besides those enumerated above, to give a negative, or nearly so, reaction with the alkaline solution of chlorine.

In testing for morphia, the solution must be neutral or alkaline ; excess of chlorine must be avoided, and no substance should be present which will give a red colour with alkalies.

Causes of Loss in Extracting Sulphur. F. Sestini. (*Gazz. Chim. Ital.*, iv., 241-245 ; *Journ. Chem. Soc.*, 2nd series, xiii., 335.) It has long been known that if much gypsum is present in the sulphur submitted to the crude distillation practised at the mine, a loss of sulphur takes place. The following experiments show why this is so. When a mixture of sulphur and gypsum is heated, the latter loses water as soon as the temperature exceeds 130°. At 144° the following reaction takes place :—



In the Italian method of extraction, in which the sulphur is distilled from one earthen jar into another, both these phenomena must occur if gypsum be present. The first cause of loss, viz., the extra sulphur required to dehydrate the gypsum, was pointed out by Parodi (*sull' estrazione dello zolfo in Sicilia*), but in the Sicilian method, in which the sulphur is simply so far melted that it will trickle down through a kind of rough porous filter of earthy matter, the deoxidation of the gypsum is likely to take place only in some particular parts of the system. Another cause of loss, suggested by the discovery of the above, is the calcium carbonate, which is much

more generally mixed with the sulphur than is gypsum. When a mixture of Carrara marble and sulphur is heated at the distillation point of the latter, carbon dioxide is abundantly evolved, and thirty-three times as much calcium sulphide is formed as in the case of gypsum. The residues of the sulphur extraction always contain alkaline and earthy sulphides. It has been proposed to employ these residues in agriculture, and the author gives several analyses of different specimens, with the view of settling their value. He concludes that many of the residues contain enough calcium sulphate and carbonate to render useful their application to meadow land, while others contain enough sulphur to render them fit for sulphurising vines.

A new Reaction of Berberine. M. Klunge. (*Journ. de Pharm. et de Chim.*, 1875, 218.) When solution of chlorine is carefully added to an aqueous solution of berberine strongly acidified with H_2SO_4 or HCl , a fine red coloured zone is formed where the two liquids meet; on shaking, the colour spreads through the whole liquid. This reaction is stated to be very delicate. A solution containing $\frac{1}{10000}$ of berberine produces a distinct red coloration, and one containing as little as $\frac{1}{250000}$ still develops a perceptible pink. A large excess of chlorine must be avoided. Brucine also gives a red coloration with chlorine water, but this is less persistent than that produced by berberine. Solutions of brucine, moreover, are colourless. In order to detect berberine in vegetable tissues, the solution of chlorine is added to a decoction previously acidified with H_2SO_4 .

Preparation of Sulphovinic Acid and its Salts. Dr. T. L. Phipson. (*Chem. News*, xxx., 221.) When sulphuric acid and alcohol are mixed together without any special precautions, the temperature rises, and a certain quantity of sulphovinic acid is formed at once; but, as in the formation of this acid a certain proportion of water is set free, and prevents the continuation of the reaction, it is never completed, even after the mixture has been kept for some hours in a water bath, and at a higher temperature decomposition at once ensues. It may, nevertheless, be quite possible to obtain a sulphovinic acid tolerably pure with alcohol and sulphuric acid alone (instead of the present tedious method based on the decomposition of the baryta salt), by keeping the mixture at 100° for two or three days, and not acting upon too large a quantity. The author intends to try this experiment shortly.

To obtain sulphovinate (ethyl-sulphate) of lime, it is best to mix equal volumes of concentrated sulphuric acid and alcohol; they may

be mixed without any special precautions when small quantities only are used, and the uncovered vessel containing the mixture must be transferred to a water bath, and kept there eight or ten hours at least, during the whole of which time the temperature should be 100° , or nearly. The liquid will then have acquired a slight degree of fluorescence and a decided odour of ether (not an odour of sweet oil of wine), and should be only very slightly coloured. When cool, it is added, drop by drop, to about twenty times its volume of cold distilled water, carefully avoiding any rise of temperature, and keeping the liquid well stirred. This solution is saturated with pulverised chalk, added in small quantities at a time, until effervescence ceases. When a slight excess of chalk has been added, filter off the sulphate of lime, heat the filtrate in the water bath with a little carbonate of lime for about half an hour, filter while warm, and evaporate at a heat not exceeding 100° till a permanent saline layer forms on the surface; then place the capsule in a moderately dry place. In about twenty-four hours the crystals are formed; the mother liquor will give another crop when allowed to evaporate over sulphuric acid or chloride of calcium. If the chalk contains iron or manganese, their sulphovinate remain in the mother liquor, and are perfectly separated by pressing the crystals.

Sulphovinate of lime crystallizes rather slowly, even in very concentrated solutions; it forms large, brilliant plates, something like chlorate of potash; its composition is represented by $C_4 H_5 O, S O_3 + Ca O S O_3 + 2 H O$; it is very soluble in water and in alcohol. The impure salt can easily be purified by recrystallization from alcohol.

Sulphovinate of baryta has a similar composition and similar properties; it can be obtained in the same manner. When the crystals are pure, they form very large brilliant plates, oblique rectangular prisms, modified in certain angles. Both this salt and the lime salt often present a peculiar pearly aspect, which is not observed on small pure crystals; these are perfectly transparent, and this pearly aspect seems to be mainly owing to minute quantities of carbonate or sulphate dispersed through the larger crystals. The sulphovinate of soda could be obtained pure from either of these salts without difficulty, but, for the preparation of the pharmaceutical product on a large scale, it is more economical to make it directly.

The Preparation of Sulphovinate of Sodium. M. Dubois. (*Journ. de Pharm. et de Chim.*, 1875, 44.) The two methods suggested by the author are based on the solubility of sulphovinate of sodium, and the insolubility of sulphate of sodium in strong alcohol.

I. To the impure sulphovinic acid prepared in the usual manner, a concentrated solution of hydrate of sodium in alcohol of 96 per cent. is gradually added in small quantities at a time, the mixture being well cooled during this addition, until the sulphovinic and sulphuric acids are neutralized. The filtered liquid is evaporated in a retort on a water bath, until a pellicle forms on the surface, and then allowed to cool, when the salt will be obtained in pure and white crystals.

II. The cold impure sulphovinic acid is diluted with alcohol of 96 per cent., and then neutralized with powdered carbonate of sodium. The filtered liquid is evaporated and allowed to crystallize as in I., and the crystals are purified, if necessary, by recrystallization.

Iron reduced by Hydrogen. P. Carles. (*Journ. de Pharm. et de Chim.*, Sept. 1874, 178-181; *Amer. Journ. Pharm.*, 4th series, iv., 560.) The author estimates the amount of metallic iron in this preparation by operating upon 0.1 gram, mixed with 5 grams of hot water in a flat-bottomed dish, with a solution of 4.53 grams of iodine, and 5 grams of iodide of potassium, in 100 c.c. of water. 1 c.c. of this solution combines with 0.01 gram of iron. If the iron is greasy, has been considerably heated, or is superficially oxidized, the application of heat to the mixture may have to be repeated. That all the iron has combined with the iodine, is evidenced by the residue which remains not evolving hydrogen with hydrochloric acid. A separate portion of the iron is treated with hydrochloric acid, and the resulting gas passed through a solution of sugar of lead, in order to estimate the sulphur as sulphide of lead. The undissolved residue contains sand, carbon, etc.

The author gives the following analytical results of different samples:—

1. Silica and carbon, 0.90; iron, 75.0; oxide of iron, 24.0; sulphide of iron, a trace.

2. Silica and carbon, 1.10; iron, 52.0; oxide of iron, 46.50; sulphide of iron, 0.20.

3. Carbon and sand, 5.30; iron, 58.0; oxide of iron, 34.50; sulphide of iron, 2.07.

4. Carbon and silica, trace; iron, 99.0; oxide of iron, sulphur, sugar, and loss, 1.0.

5. Porphyrized iron of unknown origin, is with difficulty assayed by the proposed method: carbon and silica, 7.10; iron, 70.0; oxide, 20.10; sulphide, 2.70; phosphorus and loss, 0.10.

6. Carbon and silica, 0.80; iron, 58.70; oxide, 40.0; sulphide, 0.20.

7. On being dissolved in hydrochloric acid, it evolved much gas of a disagreeable odour, containing carburetted and phosphoretted hydrogen. Residue, 0.40; iron, 54.0; oxide, 45.0; sulphide, 0.40.

8. Carbon and silica, 0.02; iron, 73.0; oxide, 24.0; sulphide, 2.90.

9. Carbon and sand, 11.59; iron, 32.0; oxide, 55.20; sulphide, 1.20.

The author concludes that the reduced iron of commerce is not carefully prepared, and suggests that it be replaced by other ferruginous preparations, which the pharmacist may readily obtain in a state of purity, which can be assayed with exactness, and whose absorption is quite certain.

Ferrum Redactum. M. Crolas. (*Journ. de Pharm. et de Chim.*, xx., 30.) The author finds that the sulphide of iron, invariably present in the iron reduced by hydrogen, emanates from the sodium sulphate which occurs as an impurity in the caustic soda used for the precipitation of the ferric hydrate, and also from the calcium sulphate occurring in the water used for washing. The bulky precipitate carries down appreciable quantities of these sulphates, which, during the process of reduction, give rise to the formation of ferrous sulphide.

In order to produce a pure reduced iron, he prepares a solution of ferrous chloride, from which he removes any sulphuric acid present by barium chloride. The Fe Cl_2 is freed from the excess of barium chloride by crystallization; then redissolved in water, peroxidized by nitric acid, and precipitated as ferric hydrate by ammonia. The precipitate need not be washed, as any ammonium chloride adhering to it is completely expelled by the subsequent ignition. By heating the resulting peroxide in a current of pure hydrogen (prepared according to the method of Dumas and Boussingault) a preparation is obtained, which leaves nothing to be desired.

Combinations of Alkaloids with Iodine. Harry R. Bauer. (Abstract of a paper, *Archiv der Pharm.*, Oct. 1874, 289-309; *Pharm. Journ.*, 3rd series, v., 402.) The following are the compounds of alkaloids with iodine, which are described by the author. Full details of the experiments upon which the formulæ are based are given in the original paper.

Compounds of Quinine with Iodine.

Iodoquinine.— $4 (\text{C}_{20}\text{H}_{24}\text{N}_2\text{O}_2) 3 \text{I}_2$.—The vapour of iodine acting upon quinine colours it superficially yellow. Pelletier stated that by triturating together one part of iodine and two parts of quinine

with the addition of alcohol, at first iodoquinine is formed, and afterwards hydroiodoquinine, in spongy crystals; and that if this latter were removed by hot water, the iodoquinine would remain as a saffron-yellow friable mass, softening at 25°C ., and melting at 80°C . In one hundred parts he found 69.69 quinine, and 30.31 iodine, from which data Gerhardt constructed the formula $2\text{C}_{20}\text{H}_{24}\text{N}_2\text{O}_2, \text{I}_2$. This statement by Pelletier, the author is unable to confirm. He rubbed together the proportions of iodine and quinine stated, then poured the alcohol upon the mass, of which but very little was dissolved. The mass was of a uniform red-brown colour; nothing was removed either by hot or cold water. The small portion that was soluble in alcohol was thrown down upon the further dilution of the alcoholic solution with water. After the precipitate had been dried, it lost the property of dissolving in alcohol; it was, however, easily soluble in solution of iodide of potassium. The compound had evidently undergone some change, and in order to ascertain whether it had lost either iodine or quinine, the filtrate was tested with delicate tests for iodine, but none was discovered. Upon the addition of caustic soda, however, quinine was immediately precipitated. The substance precipitated from the alcoholic solution was amorphous, and of a deep yellow. Analysis indicated the formula, $4(\text{C}_{20}\text{H}_{24}\text{N}_2\text{O}_2) 3\text{I}_2$. The estimation of the iodine was made by precipitating with nitrate of silver, with which the reaction very readily takes place.

Very accurate results were obtained in estimating the alkaloid (after the removal of the iodine) with iodohydrargyrate of potassium. This reagent was suggested for the qualitative detection of alkaloids by Winkler, in 1820, and recommended by Planta-Reichenau in 1846; F. F. Mayer employed it for quantitative analysis. The solution contains 13.456 grams of chloride of mercury, and 49.8 grams of iodide of potassium to the litre. The method is a very delicate one, in many cases excelling even the phosphomolybdic acid test. Distinct evidence is obtained with a solution containing 1 part in 2500 of morphia, 1 in 2500 of nicotine, 1 in 7000 of atropine, 1 in 8000 of coniine, 1 in 15,000 of strychnine, 1 in 5000 of narcotine, 1 in 50,000 of brucine, 1 in 50,000 of quinine, 1 in 75,000 of cinchonine, or 1 in 125,000 of quinine.

Iodoquinine.— $4(\text{C}_{20}\text{H}_{24}\text{N}_2\text{O}_2) 5\text{I}$.—The residue which was not dissolved by alcohol in the preparation of the above iodoquinine was of a deep brown colour, and nearly resinous consistence, and contained isolated dark brown acicular crystals. Analysis showed it had the composition $4(\text{C}_{20}\text{H}_{24}\text{N}_2\text{O}_2) 5\text{I}$.

Quinine Hydriodate.— $C_{20}H_{24}N_2O_2, HI$.—Obtained from the acid and the base. It is necessary, however, that no excess of hydriodic acid should be used, otherwise an acid hydriodate of quinine will result.

The hydriodate of quinine crystallizes in slender, brilliant yellow needles, hardly soluble in cold water, readily soluble in alcohol and ether. Winkler also has described this compound, but he says that it is not crystalline. He prepared it by mixing 240 parts of hydrochlorate of quinine with 460 parts of iodide of potassium in aqueous solution. After it had cooled, a colourless turpentine mass subsided, which in a water bath melted like a resin.

Acid Quinine Hydriodate.— $C_{20}H_{24}N_2O_2, 2HI + 5H_2O$.—Prepared by dissolving quinine in an excess of hydriodic acid. It crystallizes in golden yellow flakes. This salt has already been described by Hesse.

Quinine and Cinchonine Iodide.— $(C_{20}H_{24}N_2O_2)(C_{20}H_{24}N_2O)2I_2$.—Equal parts of quinine, cinchonine, and iodine were rubbed together. The mass was uniformly coloured red-brown, the iodine reacting energetically. Treated with alcohol, only a trace of iodine, together with quinine and cinchonine, was dissolved. The residue not dissolved by the alcohol was insoluble in water also, slightly soluble in ether, and soluble in alkalies and acids. Under the microscope this double iodide of quinine and cinchonine showed a crystalline structure. The compound was readily decomposed by nitrate of silver, by the aid of which reaction the above formula was constructed.

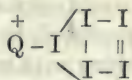
Quinine Biniiodide.— $C_{20}H_{24}N_2O_2HI_2$.—If solution of iodine in iodide of potassium be added to acid sulphate of quinine, a voluminous kermes-brown precipitate is produced, having the above composition. It is decomposed by long washing with water. Biniiodide of quinine is soluble in alcohol and in iodide of potassium solution; also in ether, chloroform, and carbon bisulphide. It is especially soluble in boiling benzol. If it be dissolved in hot alcohol, and the alcohol be left to cool spontaneously, crystals are deposited, having a pretty bronze lustre. When dissolved in nitric acid the solution at first has a red colour, but afterwards becomes colourless. Is this due to an oxidation of iodine to iodic acid?

By a slight variation of the process the author obtained a body which in appearance was identical with the above quinine biniiodide, but in relation to its solubility was essentially different. In this case the quinine salt was dissolved in alcohol, and to it was added an alcoholic solution of iodine. No precipitate was produced at first,

but after long standing it threw down a flaky crystalline body, having a bronzy lustre. In form of the crystals, colour, and proportion of iodine it resembled the biniodide. On the other hand, it was slightly soluble in water, alcohol, ether, and carbon bisulphide; insoluble in benzol; difficultly soluble in chloroform. The alcoholic solution, heated for some time to 112° C., acquired an acid reaction. (Decomposition into hydriodic acid and some compound containing less iodine.)

Quinine Pentiodide.—The quinine biniodide was dissolved in alcohol, and thrown into an excess of alcoholic solution of iodine. After several days there was a non-homogeneous crystalline formation. Red-brown, almost black, prisms were surrounded by dark-coloured substances of almost pitchy consistence, from which, as far as possible, the crystals were separated mechanically; but attempts to separate the two bodies by different solvents entirely failed, both being soluble in alcohol, ether, and chloroform. The crystalline body exhibited interesting properties in polarized light.

The colour of quinine pentiodide in alcoholic solution is entirely changed by carbon bisulphide and potassium cyanide. Analysis indicated the formula $C_{20}H_{24}N_2O_2, HI_5$ (or 66 per cent. of iodine). The author, however, was unable in any way to prevent the formation of the pitchy product, and therefore looks upon the foregoing estimation, obtained by precipitation with silver nitrate, as very imperfect, the crystals always retaining some portion of the impurity. But he considers there is proof that quinine can form a compound containing a large proportion of iodine, and he suggests that the constitution of this compound may be—



Compounds of Cinchonine with Iodine.

Cinchonine Hydriodate.— $C_{20}H_{24}N_2O, HI + H_2O$.—Two parts of cinchonine were triturated with one part of iodine. The mass was coloured red-brown, the iodine reacting violently. Treated with 93 per cent. alcohol, a portion was dissolved. Evaporation of the alcohol gave pale yellow crystalline needles, which were soluble in water, alcohol, and ether; traces were soluble in benzol and in chloroform. Analysis showed that the body so obtained was the hydriodate of cinchonine, already described by Von Regnault, v. Planta, Winkler, and Hesse.

Cinchonine Biniodide.— $C_{20}H_{24}N_2O, HI_2 + 2H_2O$.—When the

mass formed by rubbing together two parts of cinchonine and one of iodine yields nothing further to alcohol, there remains a saffron-yellow body, crystallizing in scales, which is slightly soluble in absolute alcohol, ether, and chloroform, insoluble in water, cold and boiling benzol, and yields only traces to carbon bisulphide. The solution in absolute alcohol upon dilution with water throws down the body unchanged. From these properties the author considers this compound identical with Pelletier's cinchonine iodide.

Cinchonine Tri-iodide.— $C_{20}H_{24}N_2O$, HI_3 .—Sulphate of cinchonine was mixed with solution of iodide of potassium containing iodine; it immediately yielded a voluminous red-brown precipitate. To this as much alcohol was added as was necessary to dissolve the precipitate. Upon evaporation the solution deposited red-brown crystalline prisms, which by exposure to light became brown-red. Cinchonine tri-iodide is insoluble in cold or hot water, very slightly soluble in ether, insoluble in cold and slightly soluble in hot benzol, insoluble in absolute alcohol and chloroform, and only yields traces to carbon bisulphide. It dissolves in sulphuric and nitric acids, with a red coloration. It is readily and entirely decomposed in the cold by nitrate of silver, the products being iodide of silver and nitrate of cinchonine; this reaction was used in calculating its formula.

Morphine Hydriodate.— $C_{17}H_{19}NO_3$, $HI + 3H_2O$.—Morphine dissolved in aqueous solution of hydriodic acid forms after some time a white silky crystalline salt, readily soluble in hot water, ether, and alcohol, and difficultly soluble in chloroform. Pelletier first described this salt, but the author is unable to confirm his statement that it is soluble in cold water. Winkler obtained it in four-sided prisms, by adding two parts of acetate of morphine to one part of iodide of potassium.

Morphine Sesqui-iodide.— $2C_{17}H_{19}NO_3$, $3I$.—Upon rubbing together two parts of morphine with one part of iodine the mass is coloured red-brown, and upon being heated with alcohol is entirely dissolved. Upon dilution of the alcoholic solution, reddish brown crystalline plates are deposited, which are soluble in alcohol, ether, and chloroform; in cold acids they are insoluble, but become soluble upon the application of heat.

Morphine Tetra-iodide.— $C_{17}H_{19}NO_3HI_4$.—When a morphine salt was added to a solution of iodine a kermes-brown precipitate was immediately formed, which was separated by decantation, and dissolved in alcohol. Upon dilution of the alcoholic solution, a dendritic crystallization was deposited. Finer crystals were obtained by dissolving the precipitate in solution of iodide of potassium.

Morphine tetra-iodide is soluble in alcohol, chloroform, benzol, and solution of iodide of potassium; ether and carbon bisulphide dissolve traces. Nitric and hydrochloric acids dissolve it with a fine red colour.

An iodic salt of morphine cannot be prepared; for instance, if morphine be brought into contact with iodic acid, iodine is set free by the formation of morphine sesqui-iodide. The reducing action of salts of morphine upon iodic acid is very characteristic. After dilution of a morphine salt to one part in 10,000, the iodine set free by the decomposition of iodic acid may be detected by means of chloroform and carbon bisulphide. According to Lefort, the reaction is rendered yet more delicate by the addition of ammonia. All the foregoing morphine iodides when dissolved in alcohol have a brown-yellow colour, and are changed by hyposulphurous acid and hyposulphite of sodium.

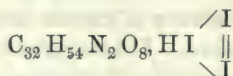
Compounds of Veratrine with Iodine.

Veratrine Periodate.—This salt is formed on bringing together alcoholic solution of veratrine and periodic acid as a pitchy mass, in which, under the microscope, crystals may be detected. The author reserves further particulars.

Veratrine Tri-iodide.— $C_{32}H_{54}N_2O_8, HI_3$.—If a veratrine salt be added to a solution of iodine, a kermes-brown precipitate is immediately produced, which is easily dissolved by the addition of alcohol. Evaporated at a gentle heat, a red-brown amorphous mass is obtained, readily soluble in alcohol, chloroform, and ether; insoluble in water and cold and hot benzol. Only traces are soluble in carbon bisulphide. If, in the evaporation, a heat above $60^\circ C$. be used, a tarry mass is produced which cannot be evaporated to dryness.

The estimation of the iodine was made by precipitation with silver nitrate; this, however, gave too high a result, some iodate being mixed with the iodide of silver precipitate.

As this compound contained hydriodic acid besides two atoms of iodine, the author treated some by shaking it with metallic quicksilver. The result was a double salt in which only two atoms of quicksilver had been taken up. The compound might therefore, perhaps, possess the following constitution:—



Compound of Strychnine with Iodine.

Strychnine Tri-iodide.— $C_{21}H_{22}N_2O_2, HI_3$.—This iodide appears to have been previously obtained by Herapath, who prepared it by warming one part of strychnine, dissolved in one part of alcohol and three parts of water, together with a little tincture of iodine. Upon allowing the mixture to cool spontaneously, fine six-sided prisms were deposited. Herapath attributed to this compound the formula $C_{21}H_{22}N_2O_2, I_3$. The same compound has been described by Tilden, who gave it the correct formula, but calculated it from different results.

The author obtained this iodide in violet-coloured prisms, similar to those of permanganate of potassium, upon mixing together sulphate of strychnine and solution of iodine, dissolving in alcohol the precipitate produced, and evaporating. Its very remarkable optical properties were described by Herapath. For instance, a crystal placed under the micropolariscope so that the axis is vertical to the polarized ray appears to be almost white; but if placed so that the long axis is parallel to the polarized ray it appears nearly black.

Strychnine tri-iodide is readily soluble in alcohol, with difficulty in ether, water, chloroform, benzol, and carbon bisulphide. The alcoholic solution is very unstable, whilst the undissolved compound can withstand a temperature of $135^{\circ}C$. Sulphuric and nitric acids dissolve this iodide with a red coloration. Strong ammonia decomposes it in the cold, as also does nitrate of silver. Alcoholic solution of the strychnine tri-iodide heated with alcoholic solution of cyanide of potassium becomes coloured, but upon cooling does not deposit strychnine cyanide, as the author expected, but the unaltered potassium cyanide. The alcoholic solution of the tri-iodide mixed with an excess of alcoholic solution of iodine, and heated in a sealed tube by means of a water bath, yielded a compound crystallizing in black prisms, which upon admitting air into the tube was decomposed into a tarry mass, containing much free iodine beside unaltered tri-iodide. (The residue probably of a higher iodized product?)

Compound of Brucine with Iodine.

Brucine Tri-iodide.— $C_{23}H_{26}N_2O_4, HI_3$.—This compound is obtained by precipitating a solution of sulphate of brucine with solution of iodine. The voluminous red-brown precipitate is washed by decantation, and dissolved in a sufficient quantity of alcohol. After slowly cooling, the solution gives a crystallization of long bronze-coloured needles.

Brucine tri-iodide is soluble in alcohol, chloroform, and benzol, and insoluble in water, ether, and carbon bisulphide. It dissolves in dilute acids upon warming. After long contact with the acids the compound is decomposed, and iodine vapour is given off.

The behaviour of this compound with polarized light is very remarkable, being quite the reverse of that of the strychnine tri-iodide. Placed with its axis parallel to the polarized ray, the crystal appears to be of a clear yellow colour; placed vertically, it appears to be brown, with a bluish shade. Its behaviour in alcoholic solution is analogous to that of the strychnine tri-iodide.

Compound of Coniine with Iodine.

Hydriodated Coniine Tri-iodide.— $3 (C_8 H_{15} N) H I, I_3$.—Geiger has stated that when iodine is triturated with anhydrous coniine, at first a blood red, and afterwards an olive-green mass is formed, which is partially soluble in water. Blyth has said that alcoholic solution of iodine, mixed with alcoholic solution, gives a yellow turbidity, which quickly disappears, and that upon evaporating this solution *in vacuo*, there remains behind a brown mother liquor and crystals, which are readily soluble in water, alcohol, and ether. The author sought to obtain this substance in a crystalline form by adding coniine dissolved in alcohol drop by drop to an alcoholic solution of iodine, until the whole of the coniine was precipitated without any excess of iodine solution remaining. There resulted at first a turbidity, which quickly disappeared. The alcohol was, therefore, evaporated at a gentle heat, when there remained a pale yellow-coloured mass, smelling strongly of coniine, readily soluble in water, alcohol, ether, and chloroform; insoluble in cold and hot benzol; only yielding traces to carbon bisulphide. Dissolved in water, and allowed to stand during a week over chloride of calcium, pale yellow perfectly formed octahedra were deposited, which smelt strongly of coniine. From solution in ether it crystallized in stellate groups.

After several unsatisfactory attempts at analysis the author obtained concordant results by adopting Carius's method of heating the alkaloidal compound in a closed tube with nitric acid and silver nitrate. Five experiments gave a mean of 57·370 per cent. of iodine, from which the formula $3 (C_8 H_{15} N), H I, I_3$ was calculated, which requires 57·466 per cent. of iodine. It was sufficiently evident that the compound contained hydriodic acid, for when it was shaken with metallic quicksilver, a double salt was formed, in which three atoms of mercury had been taken up.

The author's experiments were conducted in the laboratory of Dr. Wittstein, at Munich.

Note on the Proximate Analysis of Chinchona Bark. *Limited to the Separation of the Four Alkaloids, Quinine, Quinidine, Cinchonine, and Cinchonidine, and the Three Acids, Quinic, Quinovic, and Quinotannic.* Robert M. Cotton. (*Amer. Journ. Pharm.*, January, 1875.) The process given below is nothing more nor less than a combination of methods reported by different authorities, and given in Watts' "Dictionary" and Gmelin's "Handbook," modified in some particulars after trial. The writer has found all the results of this process to be satisfactory.

Any desired quantity, say half a pound, of the powdered bark is macerated with warm water for two or three days, and then completely exhausted by percolation. The percolate is acidulated with hydrochloric acid, then mixed with caustic soda till alkaline, and the mixture set aside for some hours till the precipitate subsides. The whole is then filtered, and the precipitate well washed with cold water; this precipitate, *a*, contains the alkaloids, and the filtrate, *A*, contains the acids.

The washed precipitate, *a*, when exhausted with ether, yields a solution (*b*), containing the quinine and quinidine, while cinchonine and cinchonidine are left undissolved. Precipitate *a* is again washed with water, and then treated with alcohol of 90 per cent., which dissolves the cinchonidine with a little cinchonine: solution *c*. Precipitate *a*, washed again with water, remains as nearly pure cinchonine. The residue of solution *c* is the cinchonidine, with a little cinchonine. (Cinchonine is soluble in about 120 parts of 90 per cent. alcohol; cinchonidine in about 12 parts of the same solvent.)

The quinine and quinidine of solution *b* are separated from each other by the different solubility of their oxalates, as follows:—A moderately dilute solution of oxalic acid is added to produce an acid reaction; the ether is allowed to evaporate, or is distilled off; and the residue treated with water. The solution (*d*) contains the quinidine as oxalate, together with a little oxalate of quinine. The residue not soluble in water, is dissolved with dilute sulphuric acid, as acid sulphate of quinine (solution *e*). By precipitation with an alkali, quinine is obtained from solution *e*, and quinidine from solution *d*.

Each of the four alkaloids may be obtained in crystals from a saturated alcoholic solution.

In separating the acids the quinovic acid is precipitated with normal lead acetate, leaving quinic acid in solution. Also, if the lead acetate

is added short of saturation, the quinotannic acid remains in solution. To accomplish this result two thirds of solution *a* is treated with neutral acetate of lead solution just to complete saturation, and immediately mixed with the remaining one third. The precipitate of quinovate of lead is filtered out, washed with water, suspended in water, and decomposed by dropping in very dilute sulphuric acid, until the precipitate turns white, carefully avoiding an excess (which would decompose the quinovic acid). The liquid is decanted from the lead sulphate upon a filter, and the filtrate concentrated and left some time to crystallize the quinovic acid.

The filtrate from the precipitate by acetate of lead is concentrated to the consistence of a thin syrup, and set aside to crystallize. It may require the insertion of a nucleus for crystallization. There should now form a crystalline mass (quinic acid), mixed with yellowish drops of oily consistence (quinotannic acid). The mass is washed with ether, the residue being quinic acid, and very deliquescent.

The ether solution when evaporated leaves uncrystallizable quinotannic acid.

Action of Sulphuric Acid upon Lead. A. A. Mallard. (*Bulletin de la Soc. Chim. de Paris*, July 20th, 1874; *Chem. News*, xxx. 197.) The lead employed in these experiments consisted of—

Lead	99.62
Antimony	0.14
Iron	0.03
Matters not determined	0.21
	<hr/>
	100.00

The acid employed was of an ordinary quality, containing traces only of nitrous acid. Sulphurous acid was not present. The incompatibility of sulphurous acid, and of traces of nitrous acid dissolved in sulphuric acid, is not absolute. Both have been found simultaneously present. Acids below 61° B. were gradually concentrated by ebullition until they reached 250° C., the point at which acid of that strength boils. They then attack lead, yielding merely sulphurous acid and sulphate of lead. Acids above 61° B., and below 65.5° B., were concentrated by ebullition up to 320° C., the point at which acid of that strength boils. They then attack lead, producing sulphurous acid, sulphate of lead, and a little sulphur. Acid of 65.5° B. attacks lead at 250° C., yielding sulphurous acid, sulphate of lead, and sulphur.

Preparation of Hypo-Phosphorous Acid. J. Thomsen. (*Ber. der*

deutsch. Chem. Ges., July 27th, 1874; *Chem. News.*, xxx., 207.) 285 grams of pure hypo-phosphite of baryta were dissolved in five litres of water, and mixed with 98 grams sulphuric acid, previously diluted with three to four times its weight of water. The liquid is well stirred, and allowed to stand till the next day, so that the sulphate of baryta may settle. The clear liquid is then drawn off with a siphon, and evaporated down at a boiling heat in a porcelain capsule. When the liquid is reduced to one tenth of its original bulk it is transferred to a platinum capsule, and a thermometer is suspended in the liquid (not touching the bottom) to regulate the temperature. The heat is kept first at about 105° C. A trace of a foreign body generally separates. The liquid is then filtered hot through washed paper, and returned to the platinum dish without being allowed to boil. After being heated for a quarter of an hour to 140°, the temperature is gradually raised to 130°, still avoiding ebullition. When it has been kept at this heat for about ten minutes, the flame is withdrawn, the liquid cooled, and poured into a stoppered glass bottle.

On the Precipitation of Metals by Zinc. J. L. Davies. (*Journ. Chem. Soc.*, 2nd series, xiii., 311.) The author failed to precipitate to any appreciable extent many of the metals which, according to some metallurgical books, are precipitated by zinc from acid solutions. Copper and the other well-known metals reduced by zinc go down quickly enough, but nickel, cobalt, iron, etc., scarcely at all under these circumstances. If, however, ammonia be added to solutions of these metals, the power of zinc as a precipitant is greatly increased. From a solution of nickel chloride rendered ammoniacal, zinc threw down the nickel perfectly, and the same was the case with cobalt. He also succeeded in precipitating iron to a considerable extent, but of course in this case the solution could only contain salts of ammonia.

The zinc used was in the form of filings, and the metals precipitated by it under the above circumstances present a beautiful metallic appearance, and are in a weighable form.

Care should be taken in washing, since water precipitates zinc from solutions containing but the barest excess of ammonia, throwing it (the zinc) down in the form of a bulky, gelatinous precipitate.

Crystallization of Sulphur. O. Silvestri. (*Gazz. Chim. Ital.*, iii., 578-582; *Journ. Chem. Soc.*, 2nd series, xiii., 335.) The sulphur mines of Sicily are sometimes fired by accident or design, and they are then closed, occasionally for a long time. The author has ex-

amined the sulphur which has in some of these cases been fused and slowly cooled. Not only does it appear in a state of perfect purity, but the forms of the crystals, instead of being, as in the case of sulphur which has been fused in a crucible, obliquely prismatic or monoclinic, are varieties of the trimetric system. This variety of sulphur (which is refused in commerce, because it does not correspond in appearance with that usually met with) agrees most exactly with native sulphur in angular measurement, specific gravity, solubility in carbon disulphide, melting and solidifying point, and specific heat. Full details on these points are given in the original.

Dextrin. L. Boudonneau. (*Dingl. polyt. Journ.*, ccxii., 489-493; *Journ. Chem. Soc.*, 2nd series, xiii., 247.) Dextrin may be prepared free from glucose, by dissolving the purest obtainable sample in water, filtering and decolourising with bone-char, then adding cupric chloride, followed by the addition of caustic soda sufficient to dissolve the precipitate which at first forms, boiling for half an hour, leaving the solution to stand until cold, and filtering. The glucose is then entirely destroyed. The blue liquid is then acidulated with hydrochloric acid, and precipitated by means of alcohol. This precipitate may be again dissolved and reprecipitated; pure dextrin is thus obtained.

Pure dextrin is a white substance, easily soluble in cold water; it is coloured dark red by iodine. The author concludes that Mulder's dextrins were really mixtures of pure dextrin with varying amounts of glucose. It is further shown that a very small trace of acid brings about the conversion of a considerable amount of dextrin into glucose, at a high temperature.

Sulphocarbates. G. Brownen, F.C.S. (*Pharm. Journ.*, 3rd series, v., 422.) The sulphocarbates having come pretty extensively into use, a notice of one lately examined by the author, and found peculiarly impure, may be of interest, and prevent these salts from falling into unmerited disrepute.

The specimen was labelled "sulphocarbonate of soda;" it had a disagreeable odour, and a pink colour.

It precipitated solutions of barium nitrate and chloride, and the precipitate from a hundred grains of the so-called "sulphocarbonate," after washing, etc., left an insoluble residue of barium sulphate, equivalent to 11.5 per cent. of crystallized sodium sulphate.

That carbolic acid (?) in a somewhat loose state of combination existed in this sample was proved by heating a strong solution of the salt and condensing the vapour in nitric acid; on diluting this acid, picric (carbazotic) acid was precipitated.

Other tarry compounds, fixed and volatile—probably of the phenyl or benzene series—formed the remainder of the impurities found in this sample.

It seems probable that this salt must have been made by a careless operator from the formula given in the *Pharmaceutical Journal* for January, 1869, p. 429; and a few remarks on that formula may not be amiss, especially as the process requires some skill or care to be successful. Acids of known strength should be used, and heated to the proper temperature to ensure combination, avoiding on the other hand an excessive heat, which would decompose the acid into tarry matters and other compounds of the phenyl series. If the carbolic acid was pure and exactly sufficient to change the whole of the sulphuric acid used into sulphocarbolic acid, then any salt required might be prepared by neutralizing the acid with the special base.

If free sulphuric acid be found in the sulphocarbolic, it might be combined with an additional quantity of carbolic acid, or removed by the cautious addition of solution of barium hydrate as long as a precipitate of barium sulphate occurred—an excess of baryta should be avoided, as barium sulphocarbolate is soluble; this, however, would not matter much if an alkaline salt was required, for an alkaline carbonate would displace barium as the insoluble barium carbonate. Pure salts might also be obtained by decomposing barium or lead sulphocarbonates with sulphates, as noticed in previous journals.

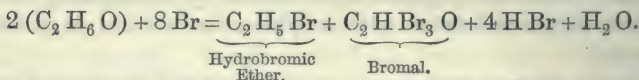
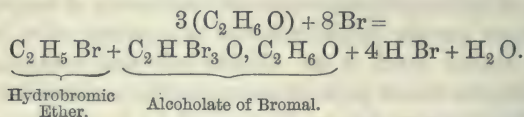
Volatile, odorous, and tarry compounds should be avoided or removed, their therapeutic value being unknown, and their presence in a definite salt objectionable.

Sulphocarbonates (at least the sodium salt) are pretty stable compounds; the author does not think they are liable to spontaneous decomposition.

Action of Bromine upon some Alcohols. M. Hardy. (*Comptes Rendus*, lxxix., 806; *Pharm. Journ.*, 3rd series, v., 463.) The action of bromine upon alcohol has been long studied. In 1832, Loewig recognized that bromal is one of the products of the reaction. He prepared it by pouring gradually three or four parts of bromine into one part of absolute alcohol, kept cool with ice; after standing for a fortnight, he distilled off three fourths of the liquid, and then added water to the residue, and thus obtained crystals of hydrate of bromal. Schœffer caused bromine vapour to pass into a relatively small quantity of alcohol, and, as products of the reaction, obtained bromide of ethyl, hydrobromic acid with a little bromine, a small

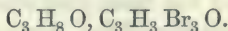
quantity of acetic ether, bromal, bromoform, tetrabromide of carbon, and a substance which was decomposed by water, giving bibromacetic acid.

Schoeffer's process, like that of Loewig, caused the formation of a quantity of secondary products, and did not manifest clearly the transformation which alcohol undergoes in the presence of bromine. This may be accomplished by dropping into a long-necked vessel containing absolute alcohol a suitable quantity of bromine in successive portions, so as to avoid too great elevation of temperature, sealing the vessel in a lamp flame. When the reaction has terminated no gas is evolved upon the opening of the vessel, and the liquid, perfectly decolourised, forms two layers, which may be easily separated. The upper layer contains hydrobromic acid in solution in water; the lower contains bromide of ethyl and bromal, a portion of the latter being free, and a part combined with a molecule of alcohol, forming a compound similar to the alcoholate of chloral described by M. Personne, and which the author proposes to call alcoholate of bromal.



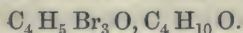
These substances separate upon distillation.

Propylic Alcohol.—Propylic alcohol, heated to 100° C., with bromine in sealed tubes, separates into two layers; the one consists of water holding hydrobromic acid in solution, the other of propyl hydrobromic ether and propyl alcoholate of propyl bromal. The propyl alcoholate of propyl bromal is a slightly yellow liquid, giving upon analysis figures corresponding to the formula:—



Butylic Alcohol.—Butylic alcohol submitted to the action of bromine under the same conditions gives a similar reaction, but the separation into two layers takes place after a more prolonged ebullition. The lower layer consists of water and hydrobromic acid; the upper of butyl hydrobromic ether, butyl alcoholate of butyl bromal, and a non-volatile residue which carbonizes at a high temperature. The butyl alcoholate was distilled by the author in a

current of carbonic acid, and gave upon analysis numbers corresponding to the formula:—



In this distillation butyl bromal was not obtained, and in rectifying under a pressure of 40 centimetres only the butyl alcoholate separated.

Amylic Alcohol.—The reaction of bromine upon amylic alcohol likewise yields water charged with hydrobromic acid and a denser liquid. The latter consists of amyl hydrobromic ether, easy to separate by distillation, and a liquid which separates upon cooling after a portion of the ether has been distilled off. This liquid, mixed with sulphuric acid, was submitted by the author to distillation under diminished pressure, when a slightly coloured liquid passed over, which gave upon analysis figures that induced him to consider it to be a molecule of amyl bromal, combined with one or two molecules of amylic alcohol.

Note on Salicylate of Methyl. John Williams. (*Pharm. Journ.*, 3rd series, v., 624.) The author used salicylic acid prepared from phenol for the artificial production of the essential oil of winter green (*Gaultheria procumbens*), which has long been known to consist of salicylate of methyl. The product was quite identical in flavour with the natural oil. It may be easily prepared by mixing salicylic acid, pure wood spirit (or methyl alcohol), and sulphuric acid together in a retort, and distilling in an oil bath, the temperature required being about 208° C.

Mr. Williams points out the curious fact that a product of the destructive distillation of coal, and a product of the destructive distillation of wood, combine together to form a natural product.

Researches on the Decomposition of some Salts by Water. M. Ditte. (*Journ. de Pharm. et de Chim.*, December, 1874, 448-450; *Amer. Journ. Pharm.*, 4th series, v., 67.) In a first note, the author has examined the action of water on mercuric sulphate, HgO, SO_3 . In contact with water and at the ordinary temperature, the mercuric sulphate becomes immediately coloured; the subsulphate, $3\text{HgO}, \text{SO}_3$ precipitates, and the water becomes strongly acid. This reaction continues on the further addition of the neutral salt, until a certain proportion of sulphuric acid has been set free, when the sulphate will be simply dissolved until the liquid is entirely saturated.

According to the experience of M. Ditte, water containing less than 67 grams of free sulphuric acid to the litre will, at 12° C.,

decompose the salt Hg O, S O_3 ; but as soon as it contains more than 67 grams of acid, it loses all its chemical action on the neutral salt, and dissolves it without decomposition. In the presence of an excess of subsulphate, some neutral salt will even be reproduced, so that, whatever the starting point was, a liquid will always be obtained containing 67 grams of acid, provided the temperature remains the same. The liquid, which ceases to decompose the neutral salt at 12°C. , will again decompose it and colour it yellow on raising the temperature. The presence of another acid in the liquid makes no change in the reaction.

The author's second note treats of the action of water on nitrate and subnitrate of bismuth, and chloride of antimony.

At the ordinary temperature, the crystals of nitrate of bismuth, $\text{Bi O}_3, 3 \text{ N O}_5, 3 \text{ H O}$, are immediately decomposed by water, which becomes strongly acid; at the same time a white precipitate, always crystalline, appears. The crystals have the formula $\text{Bi O}_3 \text{ N O}_5$ with one, two, three, or four equivalents of water, according to the temperature. The decomposition ceases as soon as the proportion of free acid is 83 grams to the litre, and then the nitrate simply dissolves. On the addition of either water or nitric acid, the composition of the mixture is modified, until it again reaches that quantity of free acid, which, if in excess, combines with the subnitrate to reconstruct the neutral salt, or, if insufficient, decomposes the neutral nitrate previously dissolved. Successive additions of water to an acid solution of neutral nitrate determine the precipitation of subnitrate, and the liquid returns always to its limit of acidity until the neutral salt has entirely disappeared.

On heating a clear solution of neutral nitrate, a crystalline precipitate of subnitrate will be observed, which disappears on cooling. In raising the temperature the limit of free acid is augmented, which the solution must have to avoid decomposition of the neutral salt; this is then decomposed, but, on cooling, the free nitric acid and subnitrate again combine, and the precipitate disappears. The subnitrate of bismuth, $\text{Bi O}_3, \text{N O}_5, \text{H O}$, is also decomposed by water into free acid and an amorphous more basic salt. The decomposition is slow in the cold, but at 100°C. the water decomposes it until it contains about four to five grams of free acid per litre, finally forming the basic nitrate $2 \text{ Bi O}_3, \text{N O}_5$. Water at 100°C. , containing less than four to five grams of acid per litre, becomes turbid, and immediately decomposes the subnitrate; the liquid becomes clear with from four to five grams; while the free acid in excess combines with the sub-salt, $2 \text{ Bi O}_3, \text{N O}_5$, formed, and the nitrate,

$\text{Bi O}_3, \text{N O}_5$, appears again, with its crystalline form and its silvery lustre. In the same manner the neutral salt, treated with water, yields at first the crystalline subnitrate, $\text{Bi O}_3, \text{N O}_5$, which, when washed with cold or warm water, is transformed into a white powder,—a mixture of the basic salts, $2 \text{Bi O}_3, \text{N O}_5$ and $\text{Bi O}_3, \text{N O}_5$. After a prolonged washing, the uniform product $2 \text{Bi O}_3, \text{N O}_5$ is obtained. What has been said above on the subject of nitrate of bismuth applies likewise to chloride of antimony, $\text{Sb}_2 \text{Cl}_5$; it is decomposed by water into a white precipitate of oxychloride, $\text{Sb}_2 \text{O}_2 \text{Cl}$, and into free chlorhydric acid until the liquid contains about 159 grams to the litre, then it dissolves without decomposition. Every liquid which contains less acid, decomposes the chloride into oxychloride and free acid; while, on the contrary, an excess of free acid reproduces the chloride. Oxychloride of antimony, like the subnitrate of bismuth, is decomposed by water, especially at the temperature of 100°C .

On Maltose. E. Schulze. (*Ber. der deut. Chem. Ges.*, 1874, 1047.) The author confirms O'Sullivan's observation that the substance produced by the action of an infusion of malt upon starch is not glucose but a peculiar kind of sugar, the composition of which is represented by the formula $\text{C}_{12} \text{H}_{22} \text{O}_{11}$. This substance, called *maltose*, has a greater rotatory power than grape sugar ($\alpha = 149.5^\circ$), and reduces Fehling's solution in a smaller proportion, 65 to 66 parts of the latter reducing as much oxide of copper as 100 parts of the former.

From its solution in water or alcohol, maltose can be obtained in the shape of fine needle-shaped crystals ($\text{C}_{12} \text{H}_{22} \text{O}_{11} + \text{H}_2 \text{O}$), which part with their water when heated to 100°C . in a current of air. When boiled in aqueous solution with dilute $\text{H}_2 \text{S O}_4$ it becomes converted into glucose, but no such change occurs under the continued action of diastase. Dubrunfaut states that starch paste when boiled with dilute $\text{H}_2 \text{S O}_4$ is first converted into dextrine, then into maltose, and finally into glucose.

The results of the author's chemical and optical examination of this substance agree very well with those previously obtained by O'Sullivan and Dubrunfaut.

Note on Diluted Phosphoric Acid. Prof. H. H. Croft. (*Canadian Pharm. Journ.*) The author confirms an observation made by Mr. L. Dolme that dilute phosphoric acid containing pyrophosphoric acid forms a white precipitate with a solution of ferric chloride. He also finds that metaphosphoric acid has a similar action. A solution of glacial phosphoric acid in cold water forms white precipitates with

ferric chloride and with albumen. Heated for some time it loses its power of precipitating albumen, but continues to act upon ferric salt. Boiled for a long time it precipitates neither. Pyrophosphoric acid obtained by the decomposition of the lead salt by H_2S , exhibits the same reaction with ferric chloride, but when boiled for some time it loses this power, being converted into the tribasic acid. Hence ferric chloride may be employed as a good test for distinguishing the phosphoric acids.

In using glacial phosphoric acid for the preparation of acidum phosphoricum dilutum, the solution should be boiled for about half an hour, or until it ceases to be precipitated by perchloride of iron.

Preparation of the Pure Carbonates of Soda and Potash. J. L. Smith. (*Chem. News*, xxx., 234.) The author recommends the following processes as yielding preparations of very great purity.

Pure Carbonate of Soda. For many years all the carbonate of soda used by me in mineral analysis has been prepared in the following way, viz., by making oxalate of soda, and then decomposing it by heat. It can be described in the shortest possible manner by giving the figures and method employed for obtaining a given result. The carbonate of soda commonly used has been the crystals of ordinary sal soda, washed with a little water to detach the adhering dust, or if one has pure soda at his command it can be used to advantage. The oxalic acid used is the ordinary oxalic acid of the shops once recrystallized, of which recrystallized acid I always have a supply of several pounds in my laboratory.

63 grams of oxalic acid and 143 grams of sal soda are dissolved by heat in 200 c.c. of distilled water. Filter the solution if necessary; to the solution of soda, when cold, add the solution of oxalic acid, just hot enough to keep from crystallizing; add it by degrees, stirring well. After the mixture is completed, it is expected that the solution will have an alkaline reaction, to keep any trace of soda in solution. The oxalate of soda will be precipitated in great part shortly after the operation is completed. Let stand for a short while to cool completely, decant the supernatant liquid, add a little distilled water, break up with a stirrer the lumps of crystals that may have formed, throw on a filter over a Bunsen aspirator, using a six-inch filter, wash with about a half litre of distilled water, and let dry. This may be placed aside in a glass bottle if not needed at once for forming carbonate of soda; the quantity of dry oxalate produced is 30 grams. To convert into carbonate project the oxalate little by little into a platinum capsule over a good sized Bunsen burner; after being strongly heated, the oxalate is decomposed into

the carbonate, and, if heated high enough to be fused, will furnish about 23 grams of fused carbonate of soda; fused or not dissolve in water, filter, evaporate to dryness, dehydrate over a naked flame, and granulate it by stirring when hot.

Double or quadruple the quantities above given may be operated upon at once with similar results. The carbonate of soda thus made is perfectly free from chlorine, sulphuric acid, silica, or other impurity that will interfere with its use in analysis.

Pure Carbonate of Potash. The starting point is pure nitre, which is a cheap potash salt, and can be readily purified by repeated crystallization; the other is oxalic acid, the commercial acid recrystallized once or twice; 50 grams of pure nitre and 100 grams of oxalic acid are placed in a platinum capsule; to this is added a small quantity of water, and heated over a gas-burner; before the mixture is entirely dry a second portion of water is added, and the heat continued until the mass is brought to dryness, at which time nearly all the nitric acid of the nitre is expelled; the heat is now continued, and the whole mass brought to redness, breaking up the lumps with an iron rod, when the oxalate of potash formed will be decomposed into the carbonate; the mass is treated with water, filtered, dried, and granulated over the flame; this furnishes about 31 grams of carbonate of potash, which may contain a trace of nitrate, but is otherwise very pure.

Determination and Assay of Sulphuric Acid. A. G. Pouchet. (*Moniteur Scientifique*, October, 1874; *Chem. News*, xxx., p. 228.) To determine the nitrous compounds in commercial sulphuric acid we take 100 c.c. of the sample, and add to it by means of a burette normal permanganate (1 c.c. = 0.005 gram pure iron) until a faint permanent rose colour is produced. This operation converts the lower oxides of nitrogen into nitric acid, and sulphurous acid, if present, into sulphuric acid. On the other hand, put in a flask of 500 c.c. capacity, 10 c.c. of a solution of sulphate of protoxide of iron, containing 0.1 gram of iron. Add the 100 c.c. of the acid previously treated with manganese, and rinse the vessel which had contained it into the flask. Boil, when the nitric acid peroxides a part of the iron, and is reduced to NO_2 , which escapes. After boiling for half an hour pour into the flask water, previously boiled, enough to fill it three quarters full, stopper, and let cool. When perfectly cold, titrate with normal permanganate till the faint permanent rose tint appears, noting the quantity of permanganate required, whence the amount of nitric acid in the sulphuric acid may be readily calculated. Kolb recommends the following process to determine the nitrous acid

in the Gay-Lussac column :—1 gram of pure dry permanganate corresponds to 0.6 gram NO_3 , and converts it into 0.85 gram NO_5 . The permanganate must not be dropped into the acid, but the acid under examination must be dropped into a known volume of permanganate until the latter is decolourised. Cold dilute nitric acid has no action upon permanganate. Kolb operates upon 0.5 gram of permanganate in solution, and the volume of acid employed to decolourise it shows the amount of nitrous acid contained. To the liquid is now added a known volume of the normal solution of iron, and the whole is boiled to expel NO_2 . Dilute with boiled water, stopper the flask, and when completely cool titrate with normal permanganate. We obtain thus an amount of nitric acid, from which it is necessary to deduct that furnished by the former operation, and which has been calculated into nitric acid. The difference shows the real quantity of nitric acid existing in the volume of liquid used in the first place to decolourise the 0.5 gram of permanganate. Suppose, for example, that it was needful to use 10 c.c. of the sample of acid to decolourise the 0.5 gram of permanganate. These 10 c.c. contain 0.300 gram of NO_3 . If, in the second place, it is found by means of the normal solution of iron that the same 10 c.c. of acid contain 0.572 of NO_3 , from this quantity we must deduct 0.425 the equivalent in NO_5 of the 0.300 of NO_3 . There remains 0.147 of NO_5 for the 10 c.c. of acid operated upon, or in 100 parts—

Nitrous Acid	...	...	...	...	3.00
Nitric Acid	...	...	...	...	1.47

Essential Oil of Cherry-Laurel. W. A. Tilden, ¹D.Sc. (Abstract of a paper read before the Bristol Pharm. Assoc., January 22, 1875.) This oil has always been supposed to be identical with the essential oil of bitter almonds, but has never, it would seem, been submitted to a systematic examination. The author having obtained a large quantity (two and a half fluid ounces) of this oil, from Mr. Umney, undertook its investigation. The quantity mentioned had been obtained as a by-product in the distillation of cherry-laurel water from 300 pounds of the leaves.

The oil had a pale yellow colour, and held in suspension a few crystals, probably consisting of benzoic acid. The specific gravity was found to be 1.0615. It contained prussic acid (less than 2 per cent. according to Umney), and had an odour much resembling that of oil of bitter almonds. When shaken with an excess of strong solution of acid sulphite of sodium, all the aldehydic constituents of the oil were dissolved, leaving only 1 or 2 per cent. of an oily substance

containing some brown resin. The sulphite when crystallized out from the solution, and distilled with sodium carbonate, yielded an essential oil, which, after drying by chloride of calcium, presented all the characteristics of pure benzoic aldehyde. It distilled without residue between 174° and 178° C., and its specific gravity at 17° C. was found to be 1.0492. This conclusion was confirmed by a comparison of its "cohesion figure" upon distilled water with that of pure benzoic aldehyde from almonds.

The small amount of viscid oil left by the bisulphite, when distilled with bichromate of potassium and sulphuric acid, yielded no volatile product; and the crystalline deposit obtained after this treatment proved on examination to be benzoic acid. The quantity of the oil from which this acid was obtained, being too small for further investigation, its nature could not be determined. It is probable, however, that this oil is benzyl alcohol, $C_6H_5C\begin{smallmatrix} H_2 \\ H \end{smallmatrix}\}O$; the more so as this alcohol and some of its compound ethers have been recognized in several other products of vegetable origin.

The author's experiments, therefore, indicate that the essential oil of cherry-laurel leaves, consists mainly of benzoic aldehyde accompanied by hydrocyanic acid, about 1 per cent. of a volatile oil (possibly benzoic alcohol), and minute quantities of an odorous resin.

It is generally understood that like the oil of bitter almonds, this oil does not exist ready formed, but is produced by the action of water. The principles contained in the leaves, which are the cause of this reaction (which, as Mr. Umney points out is instantaneous), are yet unknown, and merit investigation.

On a New Volumetric Method for determining Zinc. C. Fahlberg. (*Zeitschr. f. Anal. Chem.*, 1874, 379-383; *Journ. Chem. Soc.*, 2nd series, xiii., 665.) The author holds that none of the numerous volumetrical methods for estimating zinc in presence of the metals of the iron and alumina groups are sufficiently accurate to deserve general application. Schaffner's sodium sulphide method, modified by Künzel, mostly in use in Belgian zinc-works, becomes useless in presence of manganese and alumina. Carl Mohr's potassic ferri-cyanide and potassic iodide method is too expensive for technical purposes, and is likewise useless in presence of manganese. Fahlberg now proposes to titrate the zinc, when in presence of manganese and alumina, in a hydrochloric acid solution, by means of potassic ferrocyanide. Zinc ferrocyanide is insoluble in hydrochloric acid, manganese ferrocyanide being soluble, and the alumina is without influence upon the ferrocyanide solution. An excess of the latter

(or of the soluble manganese salt), is readily indicated by a uranium salt. The author has established, moreover, that manganese ferrocyanide dissolved in hydrochloric acid, invariably forms, in presence of a soluble zinc salt, insoluble zinc ferrocyanide.

Nickel and cobalt are likewise precipitated from a hydrochloric acid solution by potassic ferrocyanide, and the method, therefore, becomes useless if more than mere traces of these metals are present in zinc ores. The strength of the ferrocyanide solution is determined by means of *pure* zinc (1 c. c. = .010 gram Zn), dissolved in hydrochloric acid, with addition of five times its weight of ammonium chloride. The zinc ferrocyanide readily falls out in fine flakes, and is free from alkaline ferrocyanide. The end of the reaction is determined by the brown colour produced by a drop of uranium nitrate on a porcelain slab.

Ores containing galena or copper pyrites, besides blende, are treated with nitrohydrochloric acid, the solution is boiled with a little more hydrochloric acid, and saturated with sulphuretted hydrogen. The precipitated heavy metallic sulphides are filtered off; the iron in the solution is peroxidized with nitric acid; and the solution is allowed to cool, before adding excess of ammonia. The iron is separated as ferric hydrate, and the solution now contains nearly the whole of the zinc. The precipitation is repeated till no more zinc is retained by the iron. The several ammoniacal solutions are neutralized with hydrochloric acid; 10 to 15 c.c. of acid of sp. gr. 1.12 are superadded to the zinc titrated with potassic ferrocyanide, regardless of the presence of manganese.

Galeniferous blende from the Harz, containing 22.5 per cent. of zinc, as well as samples of poor blende, containing copper pyrites in varying proportions, gave very good results. The method was found both accurate and expeditious.

A New Impurity in Commercial Ammonia. G. C. Wittstein. (*Dingl. polyt. Journ.*, cccxiii., 512-514; *Journ. Chem. Soc.*, 2nd series, xiii., 485.) In a red liquid, produced by neutralizing colourless nitric acid with ammonia, the author detected the presence of one or more of the red aniline colours. This colouring matter had evidently been produced by the oxidizing action of the nitric acid upon the aniline, toluidine, or other base present in the ammonia, and derived from the gas-liquor from which the ammonia was made.

Rhatanin. Dr. B. Kreitmair. (*Annal. der Chemie*, clxxvi., 64-70; *Amer. Journ. Pharm.*, 4th series, v., 266.) Dr. Wittstein discovered (1854) in South American extract of rhatany a crystallizable compound, which he stated to be identical with tyrosin.

E. Ruge obtained (1862) the same compound, which he found to be homologous with tyrosin, and named rhatanin. Dr. Gintl (see *Amer. Journ. Pharm.* 1869, 300) obtained the same.

The author recently (1874) investigated this subject, and obtained that compound from an old sample of extract of rhatany by the following process. The extract was treated with much water, the solution precipitated with subacetate of lead, the lead removed by sulphuretted hydrogen, and the filtrate concentrated. The crystals now obtained were freed from the mother liquor, dissolved in ammonia containing some ammonium carbonate, filtered from the calcium carbonate, and again crystallized; they were obtained pure by dissolving them in hot water, adding some subacetate of lead, treating with sulphuretted hydrogen, and filtering while boiling hot. Its composition is $C_{10} H_{13} N O_3$.

To obtain a larger quantity of this body, the author examined numerous samples of extract of rhatany, obtained from different parts of Germany, one, at least, having been imported from Peru, but rhatanin could not be obtained from them or from the root, nor could it be found in catechu or kino. It is possible, but not proved, that the extract of rhatany exported from Peru is adulterated there. Subacetate of lead produced with the extracts of rhatany dark red precipitates, except with those imported from Peru, with which the precipitates were pale purplish red.

Detection of Nitrous Acid in Potable Waters. W. D. Grataina. (*Zeitschr. für Analyt. Chem.*, 1875, 72.) H. Kämmerer has stated that the ordinary mode of testing water for nitrites by means of iodide of potassium, starch, and sulphuric acid, is not reliable in the presence of nitrates, as the nitric acid liberated from the latter may become reduced to nitrous acid under the influence of organic matter (see *Year-Book of Pharmacy*, 1874, p. 198). For this reason he prefers acetic acid to sulphuric acid. Fresenius, however, has shown that the application of acetic in the place of sulphuric acid, greatly diminishes the delicacy of this test. To detect small traces of nitrites, he therefore distils about 300 c.c. of the water, with a little acetic acid, and testing the first 20 c.c. which pass over, by means of starch, KI, and dilute H_2SO_4 .

The author of the present essay shows that the above statement by Kämmerer is incorrect, and quotes a number of experiments proving clearly that a reduction of nitric acid to nitrous acid by the action of organic matter does not take place, and that it is perfectly safe therefore to apply dilute H_2SO_4 in this test, without resorting to the distillation with acetic acid. He further shows that, notwith-

standing the doubts expressed by Aeby and Fischer (*Zeitschr. für Analyt. Chem.*, 1873, 370, and *Dingl. polyt. Journ.*, 212, 204) Trommsdorff's colorimetric method for estimating nitrous acid in water, is perfectly reliable.

The Detection and Estimation of Nitrous Acid in Potable Waters, and other very dilute Solutions. P. C. Plugge. (*Zeitschr. für Analyt. Chem.*, 1875, 130.) About three years ago, the author found that a solution of carbolic acid, when boiled with a solution of mercurous nitrate, remains colourless, but assumes a red colour upon the subsequent addition of a trace of nitrous acid (*Zeitschr. für Analyt. Chem.*, 1872, 173). He now suggests the application of this reaction as a test for nitrous acid. As such it is far less delicate than the test with K I, starch, and $\text{H}_2\text{S O}_4$, but it has the advantage of not being affected by ozone, peroxide of hydrogen, chlorine, etc. It is best performed in the following manner:—Mix 5 c.c. of concentrated solution of mercurous nitrate with 5 c.c. of solution of carbolic acid (1:100) and 15 c.c. of distilled water in a flask; boil the mixture, and add to it 125 to 150 c.c. of the solution to be tested. A distinct red tint will be produced if the nitrous acid present in the solution does not amount to less than 1 in 500,000. The author's experiments further show that this test may be applied for a colorimetric estimation of nitrous acid in all cases in which approximate results suffice. In a second series of experiments the author subjects the statements made by Kubel and Fischer, in reference to the quantitative determination of nitrous acid, to a critical examination. Kubel estimates H N O_2 by acidifying the solution with $\text{H}_2\text{S O}_4$, and titrating with permanganate of potassium. Fischer points out the well-known fact that this method is inapplicable in the presence of oxidizable organic substances; and states that the distillation with acetic acid, as recommended by Fresenius, for the detection of nitrous acid, may also be employed for its quantitative determination. This statement is completely disproved by the author's experiments, the results of which are summarized in the following:—

1. It is impossible to connect a quantitative method with Fresenius' mode of separating and detecting nitrous acid by distillation with acetic acid.

2. Commercially pure acetic acid always contains substances passing over during the distillation which reduce permanganate, and is therefore not applicable for the separation of nitrous acid, in case the latter is to be estimated in the distillate by Kubel's method.

3. Kämmerer's assumed reduction of nitrates to nitrites, affords no

reason why acetic acid should be used instead of sulphuric acid in the distillation of nitrous acid from weak solutions of nitrites.

4. That portion of nitrous acid which does not pass over during the distillation becomes converted into nitric acid.

Action of Baryta on Oil of Cloves. Prof. A. H. Church. (Abstract of a paper read before the Chem. Soc., Nov. 4, 1874; *Chem. News*, xxx., 224.) The author prepared the pure eugenol from English oil of cloves, and found that the terpene accompanying it boiled at $253\cdot9^{\circ}\text{C}$. (cor.). After having been treated with sodium, an oily substance of high boiling point, and possessing a strong creosotic odour, was also observed. The pure eugenol, when mixed with basic oxide and powdered zinc, and destructively distilled, yields from 10 to 15 per cent. of an oil which, after purification, boiled at $263\cdot5^{\circ}\text{C}$. (cor.). It has the composition expressed by the formula $\text{C}_{11}\text{H}_{14}\text{O}_2$, or that of methyl-eugenol. This compound, however, is obtained by the action of sodium-eugenol on methyl-iodide, boils at 237°C ., so that the new compound would appear to be isomeric with methyl-eugenol. By oxidation it yields dimethoxybenzoic acid, $\text{C}_9\text{H}_{10}\text{O}_4$, melting at $179\cdot5^{\circ}\text{C}$.

Behaviour of Ozone with Water and Nitrogen. L. Carius. (*Annal. der Chem. und Pharm.*, Sept. 19, 1874; *Chem. News*, xxx., 242.) The author refers to the contradictory results obtained by previous observers and to his own papers (*Berichte*, v., 520), showing that ozone is abundantly absorbed by water without any change; that even in presence of nitrogen no peroxide of hydrogen is formed, and that nitrogen is not oxidized in presence of water. The proof that ozone can be absorbed in water is easily furnished by passing at low temperatures into water ozonized oxygen gas, containing not less than 0·5 per cent. The water quickly assumes the smell of ozone, and displays its characteristic reactions. Ozone, as generally obtained, is contaminated not merely with oxygen, but with hydrogen, nitrogen, and its oxides. Hydrogen is indifferent. Free nitrogen, the author has shown, in opposition to the common view, to be likewise without influence. If the oxides of nitrogen meet with ozone in presence of water they are quickly oxidized to nitric acid, thus reducing the quantity of ozone in solution, or in some cases making it disappear altogether. Schöne's recent observation that in presence of water ozone is converted into common oxygen, is also of importance. A variety of experiments confirmed the author's earlier result that, in presence of water and at medium temperatures, nitrogen is not oxidized by ozone, and water is not converted into peroxide of nitrogen. The author holds that solutions

of ozone containing not more than 5 volumes in 1000, have so characteristic an odour that they cannot be confounded by any experienced chemist with solutions of nitrous acid, chlorine, chlorous, or hypochlorous acid. Sensitive litmus-paper is quickly bleached by concentrated ozone water. Dilute solutions produce before complete decolourisation, a peculiar shade resembling imperfect reddening by an acid. Concentrated ozone water bleaches indigo, colours tincture of guaiacum deep blue, liberates iodine from iodide of potassium, and converts it into iodic acid. Solution of thalious oxide produces a brown precipitate, readily in strong solutions, slowly in weak ones. The author has not succeeded in producing peroxide of silver, even with the most concentrated ozone water.

Neutral Tannate of Quinine. M. Rozsnyay. (*Pharmaceut. Centralhalle*, xvi., 106.) A perfectly neutral tannate of quinine is obtained by dissolving the sulphate in boiling water without the addition of acid, and mixing this solution with a solution of tannic acid previously neutralized with dilute solution of ammonia. One part of sulphate of quinine will produce 2.5 parts of the tannate. The precipitate is quite tasteless, and more soluble in the gastric juice than the tannate of quinine generally met with. It is impossible to obtain a neutral preparation from an acid solution of the sulphate.

Detection of Arsenic in Sublimed Sulphur. H. Hager. (*Pharm. Centralhalle*, xv., 149.) According to the German Pharmacopœia, sublimed sulphur should be tested for arsenic by treating it with ammonia, filtering, and acidifying the filtrate with hydrochloric acid. A turbidity produced is to be taken as an indication of its presence. This test is based on the assumption that the arsenic is present as a sulphide; which, however, in the majority of cases, is incorrect, as arsenious acid occurs more frequently in sublimed sulphur than the sulphide. Arsenious acid, when treated with ammonia in the presence of sulphur, is dissolved as arsenite of ammonium, but is not converted into a sulphide; and the addition of hydrochloric acid to the filtrate cannot therefore produce a precipitate or a turbidity. The precipitation of arsenious sulphide, however, takes place immediately on the addition of sulphuretted hydrogen.

Note on Aricine. D. Howard. (*Journ. Chem. Soc.*, April, 1875.) As some uncertainty appears still to prevail about the existence of aricine as a distinct alkaloid, the author prepared this substance from a small quantity of the bark of *Cinchona Pelletieriana* (Wedd.) obtained from Mr. J. E. Howard's collection. His examination of this alkaloid proved that it is perfectly distinct from any other of the

cinchona bases, though the small yield did not permit a determination of its composition.

The bark yields a large quantity of quinic acid, differing in no respect from that of the other cinchonæ; and a small quantity of quinvine, undistinguishable from that already known, but not a trace of cincho-tannic acid or cinchona red. It also contains an intensely yellow colouring matter, little soluble in water, but freely so in alcohol, to which it imparts a beautiful green fluorescence.

The study of the alkaloid presents special difficulties. Solutions of the crude alkaloid change very rapidly when exposed to the air, the colour speedily deepening from pale yellow to dark brown, and the quantity of material at my disposal did not enable me to complete the purification. But when the alkaloid was obtained approximately pure, all the distinguishing reagents for the well-known cinchona alkaloids were carefully applied, and proved it to be different from any of them. It is scarcely possible that any impurity should have so masked their properties as to prevent their being recognized if present. The alkaloid is freely soluble in ether; solutions of its salts give no sign of crystalline precipitate on the addition of sodio-potassic tartrate. The iodide is moderately soluble in water, and will not crystallize either from aqueous or from spirituous solutions. The sulphocyanate is very slightly soluble in water, and the solution does not yield any alkaloid crystallizable from ether; the platinum salt also dissolves with difficulty in water. We may therefore pretty confidently assert that neither quinine, quinidine, cinchonidine, cinchonine, nor quinamine, is present; while the constitution of the platinum salt mentioned below, and the property possessed by the pure alkaloid of crystallizing from ether, sufficiently distinguish it from quinicine or cinchonine, and the amorphous alkaloid usually contained in cinchona bark.

On the other hand, the gelatinization of the solution of the sulphate, described by Pelletier, is very well marked, even in dilute solutions, but the author failed to obtain the sulphate crystallized from spirit that Pelletier describes. The addition of nitric acid, or of a nitrate, throws down a yellow precipitate from solutions of these salts; this may be owing to the presence of paricine.

A small quantity of the pure alkaloid, prepared by the author's uncle in 1847, which he had preserved, gave an opportunity of adding an observation of the optical properties which are also distinctive. A solution in alcohol of 90 per cent. showed a specific rotatory power of 63° for the yellow ray.

A portion of this alkaloid gave a platinum salt, which lost 4.63

per cent. of water at 105° , it then gave on ignition 13.88 per cent. of platinum, some of the author's own preparation precipitated cold by platinum chloride from a solution in hydrochloric acid, gave a salt which, when dried at 100° , gave 13.93 per cent. of platinum; to another portion the platinum chloride was added when the solution was boiling; it showed signs of decomposition, and a considerable quantity of a resinous precipitate separated, and after filtration a salt was deposited on cooling, which gave, dried at 100° , 16.16 per cent. of platinum. This last number most nearly agrees with the percentage 16.31 given by Manzini for the platinum salt of cinchovatine.

The wide divergence of these results from those given by the platinum salts of quinine and its congeners is very remarkable, and points to an altogether different constitution of the salt, strongly confirming the opinion that the alkaloid is distinct. It is hardly to be doubted that the authors who have already described this body are right in taking this view.

The properties of the alkaloid, as well as the composition of the platinum salt, tend to show that it belongs to the interesting but comparatively little known group of alkaloids comprising paricine and berberine, and it is most probable that more than one is contained in the aricine barks.

Pure Albumen. B. Aronstein. (*Zeitschr. für Analyt. Chem.*, 1874, 71.) The author corroborates Graham's statement, that by dialysis continued for three or four days, an albumen may be obtained, which does not leave a trace of ash upon incineration. He states that it is necessary, however, to use parchment paper of very good quality, and that most of the German parchment papers give unsatisfactory results. The author's conclusions are as follows:—

1. Pure albumen is completely soluble in water; its solution in the animal liquids is not effected by either the soluble or insoluble salts.

2. Pure albumen is neither coagulated by heat, nor by alcohol; in both cases coagulation depends upon the presence of salts in its natural solutions.

3. The insoluble salts, dissolved in the animal liquids, form no compound with albumen; their solution in the blood serum, as well as in the whites of eggs, is effected by an organic body which does not belong to the albuminous compounds.

4. The two liquids mentioned contain, besides albumen, paraglobulin, which albuminous body is insoluble in water, but here dissolved by the salts.

5. Pure serum albumen is precipitated by ether, but not pure egg albumen; in the presence of salts the action of ether is reversed.

Neutral Hydrobromate of Eserine. M. Duquesnel. (*Répertoire de Pharmacie*, [N.S.], iii., 105; *Pharm. Journ.*, 3rd series, v., 847.) Eserine, the active principle of the Calabar bean, is an alkaloid discovered by Vée, which combines readily with acids. The salts it forms are generally uncrystallizable and very hygroscopic. An exception to this rule, however, has been met with in the hydrobromate of eserine, which has been recently brought under the notice of the French Academy of Medicine by the author.

The best known of the salts of eserine is the neutral sulphate frequently employed by oculists. It occurs in the form of a yellowish, sometimes red, mass; but it may be obtained colourless by preventing completely the oxidizing action of the air, which converts the eserine into a red crystallizable, but inert, substance. In the amorphous state the sulphate appears to be present as a supersaturated solution; for if left to itself, stellate groups of acicular crystals are sometimes formed by the absorption from the atmosphere of a small quantity of moisture.

After employing several acids,—hydrochloric, oxalic, etc.,—without obtaining any better results than with sulphuric acid, the author employed hydrobromic acid, which yielded slowly, but regularly, stellate groups of crystals and a fibrous crystalline crust. The product was slightly coloured, but M. Duquesnel hopes in further experiments to obtain the salt nearly white. Meanwhile the present product yields almost colourless solutions, especially if boiling distilled water be used, with a slight addition of glycerin, which ensures the preservation of the solution.

The advantages claimed by the author for the new salt are its crystallizability, its perfect solubility in water, in which it forms a neutral solution, and that it can be preserved perfectly even in a humid atmosphere. It contracts the pupils as well as the other salts of eserine.

The Salicylate and Carbolate of Quinine. Julius Jobst. (*Neues Repertorium für Pharmacie*, xxiv., 193; *Pharm. Journ.*, 3rd series, v., 986.) In a communication to the *Pharmaceutische Zeitung* (No. 11, 1875), Schering states that salicylic acid forms with quinine a salt insoluble in water, and soluble in alcohol, which is not crystallizable. The author of this paper, on the contrary, states that an aqueous solution of hydrochlorate of quinine gives in the cold with salicylate of ammonia (prepared from Kolbe's salicylic

acid) a cheesy precipitate of salicylate of quinine, which can afterwards be obtained crystallized from alcohol in wonderfully fine perfect prisms in concentric groups. The same compound is formed when an alcoholic solution of quinine is mixed with an alcoholic solution of salicylic acid, to complete saturation, and the alcohol is afterwards slowly evaporated.

The salicylate of quinine is anhydrous. A determination of the quinine by the author gave the formula $C_{20}H_{24}N_2O_2, C_7H_6O_3$. The salicylate of quinine dissolved in a small quantity of water upon the addition of some dilute hydrochloric acid, and was precipitated with ammonia. The resulting precipitate of quinine was collected upon a filter, and the quinine dissolved in the ammoniacal filtrate extracted by means of ether. The above mentioned formula required 70.12 per cent. of quinine. The first experiment gave 69.66 per cent., the second, 70.17 per cent.

Salicylate of quinine dissolves in 225 parts of water at $16^\circ C.$, in 20 parts of 90 per cent. (by volume) alcohol at $13^\circ C.$, and in 120 parts of ether at $16^\circ C.$

Since the crystallized salicylate of quinine could be so easily obtained, the author turned his attention to the carbolate, which has already for some time been in no inconsiderable demand for medicinal purposes, but which hitherto has only been met with in pharmacy in a pulverulent form, and of varying composition and properties. He reports that he has succeeded in preparing the carbolate of quinine, both from water and from alcohol in slender acicular crystals. Dried at 130° the carbolate gave the formula $C_{20}H_{24}N_2O_2, C_6H_6O$. This formula requires 77.51 per cent. of quinine. Three analyses gave respectively, 77.52, 77.32, and 77.88 per cent.

Carbolate of quinine dissolves in 400 parts of water at $16^\circ C.$, in 80 parts of 90 per cent. alcohol at $13^\circ C.$, and slightly in ether.

If it could be assumed that the quinine salts of salicylic and carbolate acids have a similar therapeutic action, then the greater solubility of the salicylate would give for it the preference. In any case the author considers that henceforth for the carbolate only the definite crystallized compound should be used in medicine.

Estimation of Quinine in Cinchona Barks. M. Perret. (*Ber. deutsch. Chem. Ges.*, 1874, 735.) The author's method is based upon the fact that soluble glass (silicate of sodium) extracts the alkaloids without altering them. The following directions are given:—

Heat 10 grams bark for ten minutes with 50 grams alcohol and 5

grams silicate of sodium (40° B.), filter, repeat the heating twice, first with 30 grams alcohol and 2.5 grams silicate of sodium, then with 20 grams alcohol. Evaporate the filtrates to syrupy consistence, treat the mass with first 30 grams, then with 20 grams, and at last with 10 grams ether. Evaporate the ethereal filtrates, acidulate with sulphuric acid, and estimate quinia as sulphate. This quinia contains only traces of quinidia and cinchonidia.

Detection of Ordinary Alcohol mixed with Wood Spirit. M. Berthelot. (*Comptes Rendus*, April 26, 1875; *Chem. News*, xxxi., 238.) The two problems to be solved are: To detect the presence of common alcohol in wood spirit, and that of wood spirit in common alcohol. The latter seems solved by the elegant method which MM. Riche and Bardy have this day presented to the Academy, but M. Berthelot thinks it useful to give here the practical solution of the former. The process consists in mixing the suspected liquid with double its volume of concentrated sulphuric acid. In these conditions methylic alcohol yields gaseous methylic ether, entirely absorbable by water or concentrated sulphuric acid, whilst ordinary alcohol produces ethylene, a gas almost insoluble in water and concentrated sulphuric acid, but which may be recognized and determined by causing it to be absorbed in bromine. On operating with the precautions customary in gaseous analysis, the presence of common alcohol may be detected in wood spirit, even when the proportion does not exceed 1 or 2 per cent. Aceton and the normal impurities of wood spirit may yield, under these circumstances, carbonic acid and carbonic oxide, but not ethylene.

The Action of Bromine on Protocatechuic Acid, Gallic Acid, and Tannin. J. Stenhouse. (Abstract of paper read before the Chem. Soc., November, 1874; *Chem. News*, xxx., 246.) The author finds that, although at ordinary temperatures the action of excess of bromine on protocatechuic acid only produces mono-bromo-protocatechuic acid, $C_7H_5BrO_3$, yet at 100° carbonic anhydride is eliminated, and tetra-bromo-pyrocatechin, $C_6H_2Br_4O_2$, is formed. Similarly, the action of bromine on gallic acid gives rise to dibromogallic acid at the ordinary temperature; whilst at 100° , with excess of bromine, this is decomposed, and tribromo-pyrogallol, $C_6H_3Br_3O_2$, is formed, with elimination of carbonic anhydride. This is the more remarkable, as neither proto-catechuic acid nor gallic acid is decomposed when heated alone to 100° . Commercial bromine and ordinary tannin, when heated to 100° with excess of bromine, likewise yield bromo-pyrogallol; the small amount of water naturally

present in the materials being sufficient to convert the tannin into gallic acid, which is then further acted on by the bromine. The paper contains details of the best process for preparing proto-catechuic acid.

Volumetric Determination of Copper. P. Lagrange. (*Comptes Rendus*, October 5th, 1874; *Chem. News*, xxx., 241.) The author states that the volumetric processes for the determination of copper are few in number, and generally little employed. His method is based upon the precipitation of the copper from its nitric or sulphuric solution by hydrate of potash or soda; the conversion of the hydrate of cupric oxide thus obtained into cupro-potassic (or sodic) tartrate; and the reduction of this salt to the red anhydrous suboxide by a standard solution of pure glucose.

Action of Sunlight upon Iodide of Potassium. M. Vidau. (Abstract of a paper read before the Paris Société de Pharmacie; *Chem. and Drug.*, 1874, 408.) The author gives details of numerous experiments on the action of sunlight on potassium iodide. Attention was accidentally directed to the subject whilst preparing a solution of potassium iodide, by pouring rain water over the salt contained in a funnel. As the solution ran through into a flask, the more highly charged liquid formed a heavy layer at the bottom, with a dilute solution floating above it. It chanced that the flask received the powerful rays of the sun through an open window, and in a very short time the strong solution in the lower part of the flask (about one fourth of the whole contents) was noticed to be coloured yellow, the supernatant liquid being quite colourless. By agitation a colourless solution was obtained without action on starch water.

Experiments suggested by this observation led to the conclusion that the action of sunlight on solution of potassium iodide (enclosed in white glass flasks filled with the liquid, and sealed) is more energetic, (1) as the solutions are more concentrated; (2) as they are less alkaline. Iodine is liberated even in slightly alkaline solutions if the weight of salt equals the weight of solvent. If the solutions be slightly acidified with acetic acid, the separation of iodine readily occurs when 10 per cent. only of salt is present, whilst a similar solution, exposed to precisely the same conditions, with the exception that sunlight is excluded by a triple shield of coloured paper, gives scarcely any indication of free iodine.

Starch paper was imbued with solution of potassium iodide, enclosed in hermetically sealed glass flasks previously rinsed with distilled water, and the flasks exposed to the sun's rays. At the

end of an hour the starch paper in a white flask was coloured violet; in a blue flask, and also in a white one enveloped in two coloured papers, the one yellow and the other blue, the starch paper was unaffected. The same results were obtained with starch paper dipped in solution of tartaric acid. In an unprotected white flask exposed to diffuse daylight the effect was less decided.

Preparation of Colourless Crystallized Carbolic Acid. Dr. H. Schitzler. (*Journ. of Applied Chemistry*, from *Dingler's polyt. Journ.*) The following description is given by the author of the method employed by him in the manufacture of a fine quantity of carbolic acid. Black and muddy carbolate of soda, as it is called, is heated in a copper still, over a hot fire, until the distillate which goes over begins to look milky; 15 kilos. require about ten hours. The distillate contains water, naphthalin, tar oils, and some carbolic acid. The principal quantity of carbolic acid, however, is combined with the soda, and remains in the retort, and, on cooling, becomes solid. The maximum temperature of the vapour was 338° F., the temperature of the liquid was not measured, but must have been considerably higher. The mass was dissolved in water and diluted to about three times its original volume. In a few days a sediment had been deposited, and a sample of the clear solution was rendered milky by water. The acid was liberated from the soda in the solution by dilute sulphuric acid, and distilled off in a glass retort. After putting aside the water which went over first, a colourless liquid carbolic acid was obtained, having the odour of honey. It solidified in a few minutes, on dropping into it a fragment of chloride of calcium or of crystallized carbolic acid, and the crystalline mass seemed only moist. The portion which went over last was more liquid, and slightly yellow. The crystals were dried without loss by a Bunsen (Sprengel?) pump, the air being dried and purified by passing through chloride of calcium and cotton wool. The dry crystals were pressed between paper, and remained white for months in a well-closed glass vessel, exposed to diffused sunlight. In open glasses the crystals soon acquire a pink colour, and finally dissolve to a yellowish red liquid. This indicates that the change is produced by the particles of dust in the air. Placed upon paper in the sun, the crystals soon disappear without leaving a trace behind, showing that they evaporate readily in dry weather. On a large scale this distillation could be performed in a wrought-iron still, with tin, or perhaps lead or copper, worm. In neutralizing the soda with hydrochloric acid, great care must be taken; for, if any iron or copper goes into solution, it would change the colour

of the acid. When the carbolate of soda is not sufficiently heated, the acid has an unpleasant odour and a yellow colour.

Even when there is a large quantity of the higher liquid phenols present, a large part of the crystallizable phenol can be obtained in this way, either with or without previous partial precipitation. The supposition that small quantities of the liquid phenols can permanently prevent crystallization seems to be mere guess-work; they only keep liquid the portion that they are able to dissolve.

The essential portion of this method consists in removing, by rendering insoluble or by carbonizing, those impurities that could afterwards produce discoloration.

An experiment with carbolate of lime, containing an excess of lime, yielded an unfavourable result, for the mass became spongy, and hence a bad conductor of heat, so that the upper portion held back tarry constituents and was full of naphthalin crystals. Perhaps this was due to the excess of lime.

Saccharate of Iron. E. Hoffmann. (*Archiv der Pharmacie*, 2nd series, ii., 134; *Amer. Journ. Pharm.*, 4th series, iv., 559.) The author recommends the following process as an improvement on the one official in the German Pharmacopœia:—

Take 10 parts of solution of ferric chloride, sp. gr., 1.48, containing 15 per cent. metallic iron; $4\frac{1}{4}$ parts of powdered sugar, dissolved in an equal weight of water; 12 parts of pure carbonate of sodium, dissolved in 24 parts of water; 5 parts of caustic soda or 6 of potash solution, sp. gr. 1.33; 400 parts of boiling water, and 12 parts of powdered sugar.

The ferric chloride and sugar solution are mixed in a large porcelain dish, and the carbonate of sodium is rapidly added in four or five portions, permitting the evolution of carbonic acid after each addition; the caustic alkali is now added, when the precipitate will completely dissolve, and after a few minutes the solution is poured into the boiling water. The precipitate formed settles readily, is washed six times with hot water by decantation, collected upon a filter, or upon muslin covered with filtering paper, drained and slightly pressed. After the addition of the powdered sugar to the precipitate, the mixture is evaporated in a porcelain dish by means of a steam bath, and when of the consistence of honey, poured upon flat plates and exsiccated in the drying closet. Enough sugar is now added to make the whole weigh fifty parts, triturated with the addition of a few drops of alcohol, and again dried.

If, in the above formula, glycerin is substituted for the sugar, a glycerite is obtained, which, in the author's hands, has kept

entirely unchanged for two years. Made to contain 10 per cent. of iron, it has a handsome brown-red colour, and the consistence of a soft extract; if representing 3 per cent. of iron, it has the consistence of glycerin.

This glycerite is a very delicate test for grape sugar. Suitably diluted and heated with a trace of the latter, ferrous chloride is formed, which is recognized, after supersaturation with hydrochloric acid, by the blue colour produced with ferricyanide of potassium. Cane sugar, similarly treated, does not show this reaction.

Detection of Methylic Alcohol in Ethylic Alcohol. A. Riche and C. Bardy. (*Comptes Rendus*, xxx., 1076; *Pharm. Journ.*, 3rd series, v., 1006.) The authors find that the method described by Dumas and Peligot for detecting the presence of wood spirit by converting it into oxalate of methyl, is not applicable when the wood spirit is accompanied by any considerable proportion of ethylic alcohol. Although the crystals of oxalate are easily obtained when operating upon even traces of methylic alcohol alone, yet in the presence of ethylic alcohol the crystals of oxalate of methyl are dissolved in the oxalate of ethyl, or the two ethers unite to form mixed compounds that affect the liquid state. They consider, however, that they have arrived at a solution of the problem by means of the coloured products, differing in shade and stability, which are yielded by the careful oxidation of ethyl aniline and methyl aniline. The following is the method, which must be rigorously followed:—

Ten c.c. of the alcohol are introduced into a small flask, together with 15 grams of iodine and 2 grams of red phosphorus, and immediately distilled, the product being collected in about 30 or 40 c.c. of water. The alcoholic iodide which sinks to the bottom of the liquor is separated by means of a pipette, and collected in a flask containing 6 c.c. of aniline. The mixture becomes heated, the reaction being aided by keeping the vessel during some minutes in warm water, or moderated, if necessary, by means of cold water if it should enter into a vigorous ebullition. At the end of an hour very hot water is poured into the flask to dissolve the crystals formed, and the liquor is heated to boiling for two or three minutes until it is quite clear. An alkaline solution is then added, which sets free the bases in the form of an oil, which is brought level with the neck of the flask by the addition of sufficient water.

The oxidation of the base may be accomplished by bichloride of tin, iodine, chlorate of potash, or, better still, by a mixture indicated by Hofmann, which is formed of 100 grams of quartz sand, 2 grams of chloride of sodium, and 3 grams of nitrate of copper. One c.c.

of the oily liquid is poured upon 10 grams of this mixture, and carefully incorporated with it by means of a glass rod; it is then introduced into a glass tube 2 centimetres in diameter, and kept at a temperature of 90° C. in a water bath during eight or ten hours. The mixture is then exhausted in the same tube by three treatments with warm alcohol, which is thrown upon a filter, and made up to 100 c.c.

Pure alcohol gives a liquor of a reddish tint. Alcohol containing 1 per cent. of methylic alcohol gives a liquor manifestly violet by the side of the preceding. With 2.5 per cent. of methylic alcohol the shade is a very distinct violet, and with 5 per cent. it is considerably darker. By comparison in tubes of the same calibre with mixtures containing known quantities of the alcohols, a fair idea may be obtained of the amount of wood spirit in any given specimens.

The ordinary colorimetric methods give good results, but greater precision may be attained by adding 5 c.c. of the liquid to 95 c.c. of water, and pouring 5 c.c. of this new solution into 400 c.c. of water, contained in a porcelain capsule, and heating it in a water bath. Small fragments of white merino, free from sulphur, are then placed in the solution, and kept there half an hour, after which time they are removed, washed, and dried. If there has been no methylic alcohol present the stuff remains white; but 1 per cent. gives a violet tint which perceptibly increases in depth with the proportion of methylic alcohol.

The Examination of Beer for Adulterants. G. C. Wittstein. (*Archiv der Pharmacie*, January, 1875; *Pharm. Journ.*, 3rd series, v., 1027.) The author first refers to the addition of potash or soda to sour or stale beer. The presence of either can be determined by the proportion of ash yielded, which from Bavarian beer should not exceed one-half per cent. In a foot note the author observes that this percentage applies only to German beers, and especially Bavarian, since according to the experiments of T. Dickson, English beers are much richer in ash. Simply testing the ash for the presence of potash or soda would be insufficient, since both the raw materials of beer (malt and hops) contain these alkalies. The author states that some experimenters have been betrayed into this error, and having found these alkalies have declared beer to be adulterated.

The author divides the other possible adulterants into two classes, "sweet" and "bitter." In the "sweet" class he mentions only glucose and glycerin.

The use of glucose would lead to an economy of malt, but of course it can only compensate for the malt sugar. As, however, in

the course of fermentation through the formation of alcohol all or almost all the glucose would disappear, such beer would be abnormally poor in extractive. Glycerin not being capable of undergoing fermentation, Dr. Wittstein thinks that its addition does not allow of any reasonable explanation, and that the brewer who would add a sweet syrupy solution to his manufacture would prove himself to be wanting in prudence.

The substances employed in the "bitter" class are—aloes, buck bean (*menyanthin*), gentian root (*gentipicrin*), colchicum root, flowers, and seeds (*colchicine*), colocynth (*colocynthin*), *cocculus indicus* (*picrotoxin*), *nux vomica* (*brucine* and *strychnine*), *picric acid*, *quassia* (*quassiin*), and wormwood (*absinthin*). All of these substances are or contain bitter principles of so permeating and decided a nature, that smaller quantities of them than are usually used of hops impart great bitterness. They lack, however, the aroma and other important constituents of hops. Moreover, the majority of them possess poisonous properties.

As innocuous amongst these bitter substances may be reckoned buck bean, gentian, and wormwood, and perhaps also *quassia*; more doubtful, because in small quantities violently purgative, are *aloes* and *colocynth*. The remaining four—*colchicum*, *cocculus indicus*, *nux vomica*, and *picric acid*—are decidedly dangerous, and especially the active principles of the first three—*colchicine*, *picrotoxin*, *brucine*, and *strychnine*. Notwithstanding, therefore, that in the testing of beer generally the whole of the bitter substances mentioned should receive attention, the latter are the more important because of their peculiar virulence. But the author adds that up to the present time he has no knowledge of any one of them having been positively and with certainty referred to any beer; either because the beers actually examined did not contain them, or because in former years the detection of most of them was especially difficult. This difficulty, however, he considers has now been overcome through the progress made in organic chemistry.

The author does not appear to think that the use of these bitter substances in beer prevails to any great extent in Bavaria, and he considers that under ordinary conditions of price, hops are still the cheapest bitter for beer. He refers to the prevalent suspicion that *cocculus indicus* is added to beer by the brewer, not only to increase its bitterness, but also to increase its stupefying power. He remarks that the notorious fact that a much larger quantity of *cocculus indicus* is imported than is used for medicinal purposes has led, as in this country, to the conclusion that the largest portion

finds its way into the beer breweries. This inference, however, Dr. Wittstein considers to be a very hasty one, since the greater part is used in the extirpation of vermin and the stupefying of fish.

The author recommends the following process of testing for the above-mentioned bitter substances in beer as one that he has repeatedly proved:—

One litre of the suspected beer is evaporated by a moderate heat to the consistence of a thick syrup. This is poured into a tared glass cylinder, capable of containing ten times its volume, and weighed; five times its weight of 93° to 95° alcohol is added, and the whole frequently stirred by means of a thick glass rod during twenty-four hours. By this means all the gum, dextrin, sulphates, phosphates, and chlorides are separated, and a comparatively small portion is obtained in solution. After clearing, this solution is decanted, the residue is again treated with fresh alcohol, the two products mixed, filtered, and the alcohol driven off by a gentle heat.

(a) Of the syrupy residue left after this evaporation, a small portion is diluted with three times its bulk of water; a strip of white woollen material is then allowed to lie in the solution during an hour, after which it is removed, and washed repeatedly with pure water. If after this treatment the wool remains white the absence of picric acid is demonstrated; but if picric acid be present the wool will have acquired a yellow colour that cannot be removed by washing.

(b) The remaining largest portion of the syrup is agitated for some time with six times its weight of pure colourless benzol (boiling point 80° C.); this is decanted off, and the operation is repeated with fresh benzol, and the two liquors—the first of which has become yellow, the second having scarcely changed colour—are evaporated at a gentle heat. The pale yellow resinous residue thus obtained may possibly contain brucine, strychnine, colchicine, or colocynthin. To ascertain this, three portions of the resin are placed on a porcelain capsule, one is treated with nitric acid (sp. gr. 1.33 to 1.40), another with concentrated sulphuric acid, and the third, after a few morsels of red chromate of potash have been added, also with sulphuric acid. A red colour produced by the nitric acid indicates brucine with certainty, and a violet colour, colchicine. A red colour produced by sulphuric acid indicates colocynthin, and a purple violet produced by sulphuric acid and bichromate of potash reveals strychnine. Resin in which one or other of these colorations is produced, possesses an extremely bitter taste; that in which the coloration does not take place is also bitter, but the bitterness recalls the well-known hop flavour.

(c) The syrup which has been treated with benzol is freed, by gently heating, from the small quantity of benzol remaining, and agitated twice with pure colourless amylic alcohol (boiling point 132° C.). The first portion of the alcohol acquires a more or less wine or golden yellow colour. It would take up any picrotoxin or aloes if present, and thereby acquire a strongly bitter taste. If neither of these two substances be present, the amylic alcohol does not become bitter, because neither the hop bitter, nor the remaining four bitter principles—absinthin, gentipicrin, menyanthin, and quassiin—are soluble in it.

In order to distinguish picrotoxin from aloes, a portion of the first obtained amylic alcohol solution is poured upon glass and allowed to evaporate spontaneously. If a fine white crystallization be formed picrotoxin is present; if not aloes is present, and can only be recognized by its peculiar saffron-like odour.

(d) The syrup which has been treated with benzol and amylic alcohol is freed by means of blotting paper from the small quantity of amylic alcohol adhering to it—evaporation by heat being impracticable in consequence of the high boiling point of the alcohol—and shaken with anhydrous ether. This takes up the hop bitter yet present and absinthin. After evaporation the latter is easily recognized through its wormwood-like aroma; it also gives a reddish-yellow solution with concentrated sulphuric acid, which changes quickly to an indigo blue colour.

(e) After treating with ether, the syrup has yet to be tested for gentipicrin, menyanthin, and quassiin. As it is now free from the hop bitter, a decidedly bitter taste points to one of these three substances. Any remaining ether is removed and the syrup is dissolved in water, and filtered; to one portion is added strong ammoniacal solution of silver, and it is then heated. If it remain clear quassiin is present; if a silver mirror be formed it originates either with gentipicrin or menyanthin. Another portion is evaporated to dryness on porcelain, and concentrated sulphuric acid added. If while cold no change of colour take place, but on heating it become carmine red, gentipicrin is present; menyanthin would give a yellowish brown colour, gradually changing to violet.

Volumetric Determination of Acetates, and of Acetic Acid, in Presence of Mineral Acids. M. C. Witz. (*Bull. de la Soc. Chim. de Paris*, Jan. 20, 1875; *Chem. News*, xxxi., 173.) The changes of colour which methyl aniline violet undergoes in contact with acids, may be applied both in qualitative and quantitative analysis. Thus, acetic acid, while it reddens litmus, has no action upon methyl

aniline violet, whilst the latter is turned a greenish blue by the smallest traces of mineral acids. Hence, vinegars adulterated with mineral acids may be easily detected, and the extent of the sophistication determined. For this purpose it is sufficient to find, with a standard acidimetical liquid, first, the point of neutrality for litmus, which shows the total amount of acids; and secondly, the point of neutrality for methyl aniline violet, which corresponds to the mineral acids present. If the second result is deducted from the first, the remainder shows the amount of acetic acid. Acetates may be determined by the ordinary alkalimetical process, using methyl aniline violet as indicator, the liquid turning blue as soon as there is a trace of free mineral acid. The solution of the violet is made of the strength of 1 part in 1000.

Estimation of Chicory in Coffee. J. R. Leebody. (*Chem. News*, xxx., 243.) The author has found the following method of applying the colorimetric process for estimating the relative proportions of chicory and coffee in a mixture very convenient.

Take one gram of the unknown mixture, and one gram of a standard mixture of equal parts chicory and coffee, and remove all the colouring matter from each sample by repeated extraction with boiling water. Make the cooled extract from each up to the *same* volume (actual volume of no consequence, about 700 c.c. a convenient amount), and filter off a portion for the assay. Put 50 c.c. of the filtered extract from the *unknown mixture* in a Nessler cylinder, and determine by trial how many c.c. of the extract from the *standard mixture*, with sufficient distilled water to make up to 50 c.c. will give the same colour. Let A c.c. be required, then, assuming the tinctorial power of chicory to be m times that of coffee, the percentage (x) of chicory in the sample is given by the formula—

$$x = A \frac{m+1}{m-1} - \frac{100}{m-1}$$

If m were an absolute constant, and definitely determinable (which unfortunately is not the case) this formula would give results of perfect accuracy. Closely accurate results are, however, obtained in practice by taking $m=3$, when the above formula is written—

$$x = 2A - 50.$$

Modifications in the proportions of the ingredients in the standard mixture, and in the formula employed, will, of course, be required

for the examination of samples containing more than 50 per cent. of chicory.

The Formulæ of the Alums. S. Lupton. (Abstract of a paper read before the Chem. Soc., Dec. 3, 1874; *Chem. News*, xxx., 272.) The author finds that ammonio-iron alum $(\text{NH}_4)_2\text{Fe}_2\text{S}_4\text{O}_{14} \cdot 24\text{H}_2\text{O}$, loses $23\text{H}_2\text{O}$ at a temperature of 150°C ., and becomes anhydrous at about 230°C . The alums $\text{K}_2\text{Al}_2\text{S}_4\text{O}_{14} \cdot 24\text{H}_2\text{O}$ and $(\text{NH}_4)_2\text{Al}_2\text{S}_4\text{O}_{14} \cdot 24\text{H}_2\text{O}$ both lose 23 molecules of water at temperatures of 180°C . and 190°C ., respectively. These results prove that the formulæ of the alums given above cannot be halved, unless the improbable assumption be made that two molecules of alum coalesce in the formation of the mono-hydrated salts described by the author.

The Testing of Chloroform. G. S. Ulex. (*Zeitschr. für analyt. Chem.*, 1875, 220.) The author points out in the *Archiv der Pharmacie*, that chloroform occurs in commerce which possesses all the qualities required in the German Pharmacopœia, and is yet unfit for medicinal use. On evaporating the greater part of a sample of such chloroform, the residue develops an empyreumatic odour resembling that of wood-spirit. A mixture of this chloroform with an equal volume of concentrated sulphuric acid assumes a brown colour, whereas pure chloroform yields a colourless mixture.

The Reactions of Codeine. K. Calmberg. (*Chem. and Druggist*, 1875, 115.) The author has examined the reactions of codeine. Contrary to the statement of the German Pharmacopœia, he finds that codeine when triturated with concentrated sulphuric acid assumes a bright rose-red colour, which, on addition of ferric chloride in fragments, changes to blue, or more correctly violet, only after a long time. If liq. ferri sesquichlor. be used in place of solid ferric chloride, a dirty olive green colour is produced, which passes to violet after several hours. After longer standing, a bluish precipitate is deposited in both cases; whilst the clear liquid, held against the light, shows violet. If a fragment of codeine be introduced into a test tube containing the acid, solution takes place in half a day. This solution is clear, and of a faint brown colour. An absolutely colourless solution cannot be obtained in this way.

The Preparation of Crystalline Formic Acid. M. Berthelot (*Journ. de Pharm. et de Chim.*, 1875, 115; *Chem. and Drug.*, 1875, 78.) The author has succeeded by a simple method in preparing $\text{C}_2\text{H}_2\text{O}_4$, so as to render it completely free from the sulphurous product with which it has hitherto been more or less contaminated. The general process now in use is to decompose formate of lead by

means of sulphuretted hydrogen; the salt being placed in a long tube heated with charcoal. M. Berthelot proceeds by completely desiccating the formate of lead, and then decomposing it by sulphuretted hydrogen in an oil bath, at a temperature not exceeding 130° . The salt is placed in a large U tube, the exit end of which is drawn out and bent to an angle; once isolated, it is rectified, fractionated, and then crystallized in a freezing mixture. The acid purified by repeated crystallizations, melts at $+8.6$, a higher temperature than any hitherto remarked.

Determination of Albumen by Tannin. (*Bull. de la Soc. Chim. de Paris*, Jan. 5, 1875; *Chem. News*, xxx., 141.) The determination of albumen by a standard solution of tannin, does not give correct results, since all kinds of albumen do not combine with the same proportion of the reagent. Thus, that found in Bright's disease retains 37 per cent. of tannin, but that met with in accidental cases of albuminuria, only 28. To determine albumen by means of tannin, it is necessary to add to the albuminous liquid, half its volume of a solution containing 26 per cent. of common salt. Solution of tannin is added till all the albumen is thrown down. The whole is filtered, washed with water till free from salt, the tannin removed by means of boiling alcohol, and the residue dried and weighed.

Determination of Tannin. A. Carpeni. (*Les Mondes*, May 6, 1875; *Chem. News*, xxxi., 282.) The reagent proposed is ammoniacal acetate of zinc, with a great excess of ammonia. It forms a tannate of zinc, quite insoluble in water, ammonia, and an excess of the reagent. The precipitate is heated almost to a boil, and after cooling, it is collected on a filter, and washed with boiling water. It is then redissolved in dilute sulphuric acid, and determined by means of permanganate of potash, $1^{\circ} = 0.0076$ gram of tannic acid.

Volumetric Process for the Determination of Phosphoric Acid. J. Macagno. (*Gazzetta Chimica Italiana*, Feb. 10, 1874; *Chem. News*, xxxi., 197.) The author proposes to determine the molybdic acid in the phospho-molybdic precipitate, and calculate from it the phosphoric acid. He acidulates the alkaline solution of the molybdic precipitate with hydrochloric or sulphuric acid, and adds zinc. The molybdic acid is reduced to sesquioxide with an intense brown colour. On treating this with a standard solution of permanganate, the sesquioxide returns to the state of molybdic acid, and the liquid becomes colourless. The phospho-molybdic precipitate, dried at 100° , has the following composition:—

Molybdic Acid	90·744
Phosphoric Acid.	3·142
Ammonia	3·570
Water.	2·544

 100·000

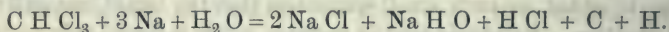
Detection of Adulterated Wines. Prof. J. Nessler. (*Centralblatt für Agrikultur Chemie*, March, 1875; *Chem. News*, xxxi., 281.) The author points out that genuine wines contain chiefly malic acid. Free tartaric acid is very rarely found, except in spurious concoctions. As a test the author uses a solution of 5 grams alcohol, and 25 grams water. If an appreciable amount of tartaric acid is present, this test produces a crystalline deposit of tartar in a quarter of an hour; whilst, in genuine wines, even if they contain a trace of tartaric acid, no precipitate appears until some hours have elapsed. Genuine wine contains no citric acid. For its detection in small quantities, the wine is rendered alkaline and filtered, acidulated with acetic acid, mixed with chloride of barium, filtered, and a few drops of ammonia added to the filtrate until it has an alkaline reaction. If, on the addition of baryta water, a white precipitate appears, citric acid is present. Oxalic acid gives a white precipitate if lime water is added in such small quantities that the liquid has still an acid reaction. Sulphuric acid in genuine wines is found only to the extent of 0·03 to 0·05 per cent.

A new Alkaloid from Morphine. G. Nadler. (*Chem. Centr.*, 1874, 675; *Journ. Chem. Soc.*) The author, by the action of ammoniacal solution of oxide of copper on morphine, has obtained an alkaloid, the chlorine compound of which is dazzling white, sparingly soluble in cold, but easily soluble in hot water, and insoluble in alcohol and ether. The aqueous solution gives with ammonia a dense white amorphous precipitate, which does not alter in the air while moist, but dries up, like aluminium hydrate. Ferric chloride produces in the aqueous solution an amethyst-red colour, which rapidly darkens. Strong sulphuric acid dissolves the alkaloid on warming, forming a dark green solution, which does not alter when heated sufficiently to volatilize the acid. Blue ammoniacal copper solution assumes a splendid green colour. Potash, like ammonia, produces in the aqueous solution a curdy precipitate, which, however, dissolves in excess in the cold. In this respect the alkaloid resembles morphine. The potash solution, when heated to boiling, deposits the alkaloid in silvery scales. The alkaloid rapidly reduces silver nitrate, and gives with platinic chloride a pale yellow

platinum salt. Dilute sulphuric acid throws down from the solution in hydrochloric acid a white amorphous sulphate. The new alkaloid is distinguished from morphine by being precipitated in the amorphous state by ammonia, by its behaviour with ferric chloride, ammoniacal copper solution, potash, and strong sulphuric acid, and by the sparing solubility of its sulphate; and from apomorphine by the fact that in the moist state it does not become coloured on exposure to the air, but remains perfectly unaltered.

Reactions of Metallic Sodium on Chloroform. Sergius Kern. (*Chem. News*, xxxi., 121.) The following is the result of the author's researches on some interesting reactions of sodium and chloroform.

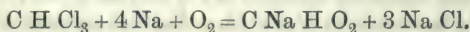
1. In a strong test tube 1 gram of chloroform and a small quantity of water were poured, whereupon 3 grams of metallic sodium were then added. A strong reaction with sparks and fire was the result, and all the interior part of the tube was covered with finely divided carbon; in the lower part, meanwhile, a white substance was deposited, which proved to be a mixture of sodium chloride (Na Cl), and caustic soda (H Na O). The reaction which took place was accompanied by the evolution of hydric chloride (H Cl), and may be represented:—



It must be mentioned here that this experiment must be made very carefully, because from the high temperature of the reaction the tube often breaks.

2. Some chloroform and metallic sodium were left for six or seven days in a loosely corked test-tube. A light brown precipitate was deposited, which was dried over sulphuric acid under a glass bell. The brown semi-crystalline powder obtained is whitened on exposure to the action of air. Its analysis proved it to be a sodium salt of formic acid (Na C H O_2), which gave with sulphuric acid free formic acid (H C H O_2).

The reaction is a very complicated one which requires further study. The author presumes that the metallic sodium is first converted into a caustic soda by the oxygen of the air, and that it acts in this state on the chloroform. The final reaction must be represented by the following equation:—



On Gentisin (Gentianin). H. Hlasiwicz and J. Habermann. (*Ann. der Chem. und Pharm.*, vol. 175, i., ii., p. 62; *Chem. News*, xxxi., 110.) This body was discovered by Henry and Caventou in the root

of *Gentiana lutea*, where it is present in small quantity. On ultimate analysis, the authors found that it contained—carbon, 64.85, and hydrogen, 4 per cent.; results which agree very closely with those formerly obtained by Baumert, and are compatible with his formula, $C_{14}H_{10}O_5$. They succeeded in procuring a gentisic acid, which fuses at 197° , and crystallizes without water. Its analysis leads to the formula $C_7H_6O_4$, identical with those of proto-catechuic acid, dioxybenzoic acid, oxysalicylic acid, and hypogallic acid; with none of which, however, it is identical, as the authors show by a comparative table of its reactions.

Preparation of Iodates and of Iodic Acid. Prof. E. Richards. (*Archiv der Pharmacie*, 2nd series, ii., 109.) The author recommends to treat a filtered solution of chlorinated lime with iodine or an iodide. By adding hydrochloric acid to the mixture, boiling with water, filtering, and evaporating to the point of crystallization, iodate of calcium is obtained in the shape of fine shining prisms, having the composition $Ca I_2 O_6, 5 H_2 O$.

By employing chlorinated soda or chlorinated baryta instead of the lime salt, the sodium or barium iodate can be obtained. From the iodate of calcium, iodic acid is readily prepared by decomposition with an equivalent quantity of sulphuric acid, separating the sulphate, concentrating the clear solution by evaporation, and allowing to crystallize.

Estimation of Chlorine in Urine. F. A. Falck. (*Ber. deutsch. Chem. Ges.*, 1875, 12.) The author applies Volhard's volumetric process for the estimation of silver, by means of sulphocyanide of ammonium (see *Year-Book of Pharmacy*, 1874, 253), to the determination of chlorides in urine. 10 c.c. of the filtered urine, mixed with a little pure potassium nitrate and pure sodium carbonate, are evaporated in a platinum dish, and incinerated. The aqueous solution of the ash is acidified by HNO_3 , mixed with 5 c.c. of solution of iron-alum, and reddened by the addition of one or two drops of the titrated solution of ammonium sulphocyanide. Standard solution of silver nitrate is then added, until the colour has just disappeared. The number of c.c. used, does not correspond quite accurately with the amount of chlorine present, as during the incineration with potassium nitrate, some nitrite is formed, and the nitrous acid liberated from this by the HNO_3 interferes with the end reaction. The exact amount of chlorine is now determined by a second experiment.

10 c.c. of the urine are acidified with HNO_3 , and at once mixed with standard solution of silver nitrate in excess. After the mixture

has been heated on a water bath to expel all the nitrous acid, the excess of silver is determined by mixing with 5 c.c. of solution of iron alum, and then adding standard solution of ammonium sulpho-cyanide drop by drop until the red colour ceases to disappear on stirring.

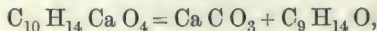
Creasote from Beechwood. A. W. Hoffmann. (*Ber. deutsch. Chem. Ges.*, 1875, 66-68; *Journ. Chem. Soc.*, 2nd series, xiii., 568.) In a former communication it was shown that the high boiling portion of creasote from beechwood contains a liquid boiling at 270°. On treating it with potassium dichromate it yielded cœrolignone and a compound crystallizing in long yellow needles. The latter body is the oxidation product of an oily liquid boiling at 285°, which was obtained pure by fractional distillation and repeated recrystallization of its sodium salts. It has the composition $C_{11}H_{16}O_3$, and the yellow body is a quinone consisting of $C_8H_8O_4$. Reducing agents convert it into the phenol, $C_8H_{10}O_4$, crystallizing in white needles. Bromine changes the quinone into $C_8H_8Br_2O_4$, forming brilliant red crystals, melting at 175°.

Liebermann's cœrolignone is identical with Reichenbach's cediret.

Lebermann (*ibid.*, 66) has also found that these bodies are identical, and explains the reasons why he formerly believed them to be different bodies.

The Nature and Constitution of Camphor and Phorone. C. T. Blanshard. (*Chem. News*, xxxi., 111.) Berthelot's supposition that camphor is an aldehyd, was fully disproved by Fittig and Tollens (*Ann. der Chem. und Pharm.*, cxxix., 371), who have shown that it has none of the properties of the latter.

Just as camphor was regarded as an aldehyd, without sufficient reason, so, from a solitary reaction, that of its formation, has phorone been called a ketone. The dibasic acids have no ketones. Suberone, the only other body derived from a dibasic acid that has been classified with the acetones, has none of their properties, being oxidised to suberic acid by means of nitric acid. In the formation of camphorone (phorone) according to the following equation:—



there is no condensation of the carbon by the union of two alcohol radicals with (CO), as in the case of the ketones.

The reactions of camphor and phorone, which, as far as they have been studied, are exactly similar, show that these bodies are allied to the phenols.

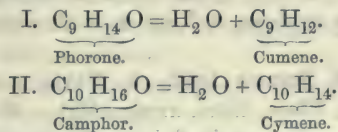
(1) With PCl_5 , they react to form, respectively, the chlorides $C_{10}H_{15}Cl$ and $C_9H_{13}Cl$, the latter being insoluble in water and soluble in alcohol.

(2) The body $C_9H_{13}Cl$, treated with ammonia, yields the hydrochlorate of $C_9H_{13}H_2N$, the amide.

(3) Potassium acts on both camphor and phorone, like phenols, replacing one atom of hydrogen in each.

The sodium compound of camphor, $C_{10}H_{15}NaO$ (sodium camphate), reacts with ethyl iodide to form the ether $C_{10}H_{15}(C_2H_5)O$ (Baubigny).

(4) They behave, when dehydrated by zinc chloride (Gerhardt), like ordinary alcohol, yielding the hydrocarbons less by H_2 than those from which they are derived thus :—



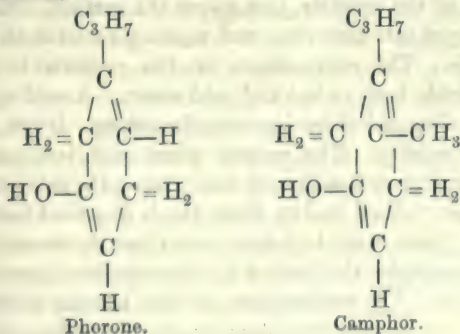
Thus, all the reactions of camphor and phorone show that they are phenols, and not aldehyds or ketones.

As regards the constitution of the bodies, camphor is cymene (methyl-propyl-benzene) + the elements of water, and phorone is cumene (propyl-benzene) + the elements of water. They are not alcohols, but phenols, as their reactions with metallic potassium and sodium show, coupled with the formation, in the case of phorone, of chloride and amide, and in the case of camphor, of the ether. They are therefore analogous to the complex phenols, *e.g.*, picric acids. They may be classed as aromatic bodies, *i.e.*, bodies allied to and derived from benzene ; for—

(1) Camphor is readily and largely soluble in aniline, according to Schiff (*Annalen*, Supp. 3, 361).

(2) By dehydration they yield homologues of benzene.

They may, therefore, be thus represented, according to Kekulé's graphical formulæ :—



The positions of the (C H_3) in camphor, and the (O H) in both camphor and phorone, have yet to be determined for their various isomeric modifications. There should be six modifications of each, the grouping ($\text{C}_3 \text{H}_7$) being either propyl or isopropyl. The two bodies are thus represented as being exactly analogous, camphor (methyl-phorone) being the homologue of phorone.

When dehydrating agents act on either of these bodies, a hydrogen atom out of each of the (C H_2) groupings unites with the oxygen atom to form water, just as phenol is reduced to benzene by means of zinc dust; the carbon atoms then unite together, as represented in Kekulé's nucleus, to form in each case a homologue of benzene.

Determination of Boracic Acid. A. Ditte. (*Comptes Rendus*, February 22, 1875; *Chem. News*, xxxi., 150.) If it be required to determine boracic acid contained in a solution either alone or in combination with alkaline oxides, a little ammonia is added to the liquid in order to neutralize any free acid, and then an excess of a saturated solution of pure chloride of calcium. All the boracic acid is then found as borate of lime, as a gelatinous precipitate, soluble by heat, in chloride of calcium in excess. The mass introduced into a platinum capsule may be then evaporated to dryness without the least trace of boracic acid being volatilized. When dry, the crucible is filled with a mixture in equal equivalents of pure crystalline chlorides of sodium and potassium, and heated moderately at first, and then to fusion. The borate of lime, much less fusible, collects at the bottom of the crucible in a spongy form, more or less agglomerated, and dissolves partially in the melting saline mass. If at the bottom of the crucible a temperature is maintained higher than in the upper part, the dissolved borate of lime crystallizes on the surface of the liquid, and forms a ring, which rises along the side of the crucible, just above the surface. Soon all the borax is conveyed into this ring, and nothing remains at the bottom of the crucible. The composition of the crystals is $\text{B O}_3, \text{Ca O}$. They are insoluble both in hot and cold water. A cold concentrated solution of alkaline chlorides does not affect them; if hot, it dissolves a very small quantity. The matter, when cold, is separated from the crucible, and treated with cold water, when the chlorides dissolve. The crystals are washed on the filter, dried, detached from the filter, and weighed. Care must be taken not to fuse the amorphous borate of lime which occupies the bottom of the crucible in an early stage of the operation. The temperature of the bottom of the crucible should be kept as high as possible short of such fusion. The crucible

cannot be heated with a Bunsen burner, but with a gas blast-lamp. On approaching the point at which the borate of lime is fused, the volatilization of the alkaline chlorides becomes visible. There should be one part of pure dried chloride of calcium for three parts of the mixture of alkaline chlorides.

A New Reaction of Essence of Mint. Dr. C. Roucher. (*Journ. de Pharm. et de Chim.*, xx., 354.) If essence of mint be shaken with twenty times its weight of acetic acid of 10° , a feeble blue coloration will be observed after some time (half an hour to one hour), which gradually increases in intensity. The colour appears blue in transmitted, and vermilion in reflected light; but changes soon to green and then to yellow.

Camphor, oil of turpentine, and oil of lemon do not produce any similar reaction with acetic acid.

Coloration of Chloral Hydrate by Oil of Peppermint. Dr. C. Jehn. (*Archiv der Pharm.*, 2nd series, iv., 326.) The author has previously stated that chloral hydrate in contact with oil of peppermint assumes a red colour (*Repertor. der Pharm.*, 1873, 434; *Year-Book of Pharm.*, 1874, 205). As this statement has since been disputed by Prof. Flückiger and Dr. Hager, he has repeated the experiment with samples of oil of peppermint obtained from different sources, and finds that the reaction differs materially with different samples of oil. The French oil shows the reaction very distinctly; the German oil only produces a pale brownish coloration; and the English (Mitcham) oil imparts hardly any colour. The reaction may therefore serve for the distinction of the three oils. The author also examined the three oils by Hager's test with sulphuric acid and alcohol (*Hager's Comm. Pharm. Journ.*, ii., 451), and here, too, he observed a difference in the results.

The Adulteration and Impurities of Tartaric and Citric Acids. A. H. Allen. (Abstract of a paper read before the Society of Public Analysts; *Chem. News*, xxxi., 277.) The principal accidental impurities of tartaric and citric acids are salts of potassium and calcium, together with iron, lead, and copper, derived from the vessels used in the manufacture of the acids. These impurities are readily found by incinerating a sample of the acid in a porcelain crucible, and examining the ash. A very fair approximative estimation of the lead or copper present may be obtained by placing the solution of the ash in a tall glass cylinder, and comparing the depth of tint produced by sulphuretted hydrogen with the tint produced by treating an equal bulk of very weak solutions of lead or copper of known strength in a similar manner.

Many samples of citric acid contain free sulphuric acid, which renders the crystals very deliquescent. This impurity is at once detected by strongly acidifying the solution with HCl , and testing with BaCl_2 .

The most common adulterant of citric acid, and almost the only substance purposely mixed with it, is tartaric acid. The author finds that the most reliable mode of detecting a moderate percentage of this adulterant consists in the addition of acetate of potassium and alcohol to the solution of the acid. He also conducted a series of experiments with a view of rendering this test quantitative (the details of which are given in the original article); the results obtained led to the adoption of the following process, which, while readily detecting two or three per cent. of tartaric acid, allows of the estimation of larger proportions with very fair accuracy:—

Dissolve 2 grams of the sample to be tested in 45 c.c. of proof spirit, filter from any undissolved calcium or potassium tartrate, add 5 c.c. of a cold saturated solution of potassium acetate in proof spirit, stir, and allow to stand for twelve hours. Filter off the precipitate produced, and wash it with proof spirit. Rinse off the precipitate from the filter with a cold saturated solution of acid potassium tartrate, digest in the cold for a few hours with occasional stirring, then filter, wash once with proof spirit, rinse off the precipitate into a small porcelain dish with boiling water, evaporate at 100°C ., and weigh the acid potassium tartrate obtained. The weight multiplied by 0.798 gives the quantity of tartaric acid in two grams of the sample examined. As a check, the dry precipitate may be ignited, and the solution of the ash titrated with standard acids; or the same method (substituting standard alkali for acid) may be applied to the purified precipitate on the filter, so as to avoid the trouble of the subsequent evaporation at a steam heat.

Oxalic acid is said to be sometimes employed as an adulterant of citric acid. This dangerous admixture would of course be readily detected by treating the aqueous solution of the sample with excess of ammonia, acidifying with acetic acid, filtering from any precipitated acid ammonium tartrate, and testing the filtrate with calcium sulphate.

Determination of Chlorine and the Alkalies in Vegetable and Animal Substances. H. Behagel von Adlerskron. (*Zeitschr. anal. Chem.*, 1873, 390-424; *Journ. Chem. Soc.*, 2nd series, xiii., 186.) This research was undertaken to decide the two following

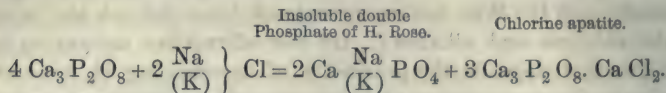
questions:—(1) Is the addition of an excess of baryta to the substance to be incinerated capable of entirely preventing a loss of chlorine? and (2) Will hot water extract from the ash the whole of the chlorine and alkalies? On the affirmative answer to the first question depends the possibility of determining chlorine and alkalies in the same portion of substance (often a matter of importance), as the only other available method of retaining the chlorine consists in the addition of a weighed quantity of sodium carbonate, which would inevitably introduce errors into the determination of the alkalies.

The serious nature of the loss of chlorine when no alkali is added is shown by experiments in which 50 grams of sugar were incinerated after the addition of 0.2 to 0.3 gram of sodium chloride. The loss of chlorine was in two cases 40 and 60 per cent. respectively. The vapours escaping during the carbonization reacted strongly acid, and the aqueous solution of the ash strongly alkaline. In both cases the whole of the sodium was recovered.

A series of experiments in which similar mixtures of sugar with sodium and potassium chlorides were mixed with varying quantities of baryta or sodium carbonate, showed that either of these additions diminished the loss of chlorine, and more effectively the larger the quantity added. Sodium carbonate is, however, superior in this respect to baryta, 3 per cent. of the former and 10 per cent. of the latter being respectively the minimum quantities capable of preventing an appreciable loss of chlorine. With a lower proportion of organic matter the amount of baryta may be diminished. Experiments with yolk of egg completely confirmed the above results. The addition of baryta *after* the substance has been partially charred is of little service, as it appears to be the volatile organic acids, which, by virtue of their relatively large mass, are able to decompose the chloride.

The second point was investigated by igniting mixtures of tricalcic orthophosphate with potassium or sodium chloride, or with a mixture of the two. In the case of the single chlorides, the residue insoluble in hot water retained a portion of the chloride, but when the mixed chlorides were employed in equivalent proportions, the chlorine retained was more than equivalent to the sum of the alkali-metals, and moreover the sodium was held much more energetically than the potassium. In three experiments with the mixed chlorides and one with sodium chloride the amount of chlorine rendered insoluble varied only from 3.19 to 3.3 parts in 100 of calcium phosphate employed.

The author gives the following equation as expressing his views on the character of the reaction :—



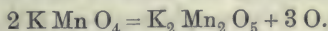
Either Rose's double salt or the apatite combines further with three molecules of calcium phosphate; the amount of chlorine retained would thus correspond very closely with the proportion actually found, and an equivalent quantity of alkali-metal would also be present. The fusion of Rose's salt with an excess of mixed alkaline chlorides would tend to the formation of the soluble double phosphate, $\text{Ca}(\text{Na}, \text{K})_4 \text{P}_2 \text{O}_8$, together with calcium chloride, which latter would combine with fresh calcium phosphate to form apatite, and thus the alkali in the insoluble residue would diminish without loss of chlorine. Experiments in which a mixture of sodium phosphate and alkaline chloride was precipitated with an excess of baryta, and the mixture evaporated and ignited, confirmed the retention of both chlorine and alkali in the residue; the proportions, however, were very variable.

The general result of the research is that by adding sufficient baryta *before beginning to carbonize*, and by dissolving the ash in cold dilute nitric acid, both chlorine and alkalies may be determined in the same portion; but since the requisite proportion of baryta is so large as seriously to hinder the incineration, it is highly advisable, where possible, to determine chlorine and alkalies in separate portions, using for the chlorine determination sodium carbonate, while by careful incineration of the other portion the whole of the alkali-metals may be retained without the use of baryta.

These experiments throw doubt on the results of many old determinations of chlorine and alkalies in the ashes of organic bodies.

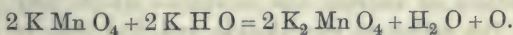
Detection of Alcohol in Ether. P. Stefanelli. (*Ber. deutsch. Chem. Ges.*, 1875, 439; *Lo Sperimentale*, xxvi.) Pure ether, when shaken with aniline violet remains colourless, but in the presence of 1 per cent. of alcohol it is distinctly coloured. According to Bratesi, aniline red may be used for the same purpose. If the ether contains water or acetic acid, it should be shaken with anhydrous potassium carbonate before applying the test. Jalap-resin is not a reliable indicator of alcohol in ether, as in presence of a small percentage of alcohol it is as insoluble as it is in pure ether. Less than 15 to 20 per cent. of alcohol cannot be detected by means of this resin.

Notes on Potassium Permanganate. C. Rammelsberg. (*Ber. deutsch. Chem. Ges.*, 1875, 232-233.) Potassium permanganate when heated gives off oxygen, and leaves a brownish black residue. It is first converted into manganate and afterwards into a substance having the composition $K_2 Mn_2 O_5$ ($K_2 O + 2 Mn O_2$).



This residue, which amounts to 84.8 per cent., is decomposed by water into $K_2 O$ and $K_2 Mn_5 O_{11}$ ($K_2 O + 5 Mn O_2$).

The author corroborates Mitscherlich's observation, that potassium permanganate is not altered by diluted alkalies, but that by boiling with concentrated solution of potassium hydrate it is converted into manganate:—



By the gradual addition of water to a mixture of permanganate and concentrated sulphuric acid, a black hydrate separates out, the composition of which is represented by the formula $3 Mn O_2 + 2 H_2 O$.

Calcic Hypochlorite from Bleaching Powder. C. T. Kingzett. (*Journ. Chem. Soc.*, May, 1875, 404.) Abstract of a paper read before the Chemical Society. After giving a brief review of the literature on the chemical constitution of bleaching powder, the author states that he observed the formation of needle-shaped crystals in a saturated solution of bleaching powder, which had been exposed during a frosty night. On exposing a concentrated solution of bleaching powder to a freezing mixture of ice and salt, the whole froze to a solid mass, which, when broken up by agitation and thrown upon a filter, gradually thawed, leaving on the filter feather-like crystals, some of which were nearly an inch long. Similar crystals were formed during the evaporation of the solution in vacuo over sulphuric acid and potash. The analyses of these crystals show that they are composed of hypochlorite of calcium, a substance never before isolated. The author regards his results as affording confirmatory evidence in support of Odling's formula $Ca \left\{ \begin{array}{l} Cl \\ O Cl \end{array} \right.$ which represents bleaching powder as a chemical combination and not as a mixture of chloride and hypochlorite of calcium. Water breaks up this feeble combination into its two main constituents.

The Action of Organic Acids and their Anhydrides on the Natural Alkaloids. G. H. Beckett and C. R. A. Wright, D.Sc. (Abstract of a paper read before the Chem. Soc., January 14th, 1875 ;

Chem. News, xxxi., 37.) The authors find that the action of acetic anhydride on dicodeine and tetracodeine yields tetracetyldicodine, $C_{78}H_{80}(C_2H_3O)_4N_4O_{12}$, and octacetyl-tetracodeine, $C_{144}H_{160}(C_2H_3O)_8N_8O_{24}$. These bases are both amorphous, but the hydrochloride of the former is crystalline, whilst the basic character of the latter is very feeble. Tetramorphine yields, with acetic anhydride, a product resembling that obtained with tetracodeine. The action of acetic acid on anhydrous morphine gives rise to three isomeric diacetyl-morphines, α , β , and γ . The first and last are crystalline, and form crystalline hydrochlorides, whilst the β compound does not. The α diacetyl-morphine is formed only in very small quantity. The authors have submitted the various diacetyl, butyryl, and benzoyl derivations of codeine and morphine which they have discovered to the action of ethyl-iodide, and find that in each case they unite with $2C_2H_5I$, forming compounds which in many instances are crystalline. The action of sodium ethylate on diacetyl-codeine, does not give rise to ethylated codeine, but codeine is reproduced and more or less polymerised to tetracodeine. A similar result was obtained with tetracetyl-morphine.

Toxicological Detection of Cyanide of Potassium in Presence of Double Non-Poisonous Cyanides. E. Jacquemin. (*Comptes Rendus*, December 21st, 1874.) The author describes a method for detecting cyanide of potassium accompanied by prussiates. He dilutes with water, filters after maceration, neutralizes the filtrate with pure carbonate of soda, heats a part to ebullition with two or three grams of hyposulphite, then after cooling, acidulates slightly with hydrochloric acid, and adds perchloride of iron, which gives the characteristic reaction of sulphocyanides.

Detection of Alum in Bread. J. A. Wanklyn. (*Chem. News*, xxxi., 66.) In a paper read at a meeting of the Society of Public Analysts, February 5th, 1875, the author recommends the following process, which is a modification of the method proposed by Dr. Dupré, and described in the *Chem. News* (xxix., 233).

100 grams of bread are incinerated in a large platinum dish, capable of holding the whole quantity at once. The incineration is managed at a comparatively low temperature, and takes some four or five hours; the platinum dish being heated by means of a large Bunsen burner, abundantly supplied with air. It is well to continue the ignition until the bread-ash is nearly completely burnt, and it is advisable to weigh the dish containing the ash. The weight of the ash should not sensibly exceed two grams. The ash having been obtained, is then moistened with 3 c.c. of pure strong

hydrochloric acid, and then some 20 to 30 c.c. of distilled water is added, and the whole is boiled, filtered, and the precipitate washed several times with boiling water. In this manner a precipitate consisting of silica, together with some unburnt carbon, is left on the filter, whilst the filtrate contains the phosphates. The precipitate which, after being burnt consists of silica, is weighed. The filtrate is mixed with 5 c.c. of liq. ammoniæ (sp. gr. 0·880), whereby it is rendered powerfully alkaline and opaque, owing to the precipitation of the phosphates. It is finally mixed gradually with some 20 c.c. of strong acetic acid, and as the acid is being poured in, it is to be observed that the liquid is alkaline and opaque until some 5 c.c. of acid have been added; that when about 10 c.c. have been added the liquid is acid and much clearer, and that at least 10 c.c. of strong acetic acid are added after the establishment of a distinctly acid reaction. The liquid is then boiled and filtered, and the precipitate, consisting of phosphates of alumina and iron, well washed with boiling water, ignited, and weighed. The last step is the determination of the iron in the weighed precipitate, and this is accomplished either by reduction and titration with standard solution of permanganate in the well known manner, or else by a colour-process: viz., by titration with ferrocyanide of potassium. Having ascertained the amount of iron in the precipitate of mixed phosphates, it is only necessary to calculate it into phosphate of iron, and to subtract the weight of the phosphate of iron from the total weight of the mixed phosphates, and the difference is the phosphate of alumina yielded by 100 grams of the bread. The following results have been obtained by applying the above-described process to samples of bread presumed to be free from alum:—

From 100 Grams of Bread.

	Bread-ash.	Silica.	Precipitate Insoluble
	Grams.	Grams.	Acetic Acid.
			Grams.
A. . .	1·408 . .	— . .	0·010 . .
B. . .	1·378 . .	— . .	0·006 . .
C. . .	1·730 . .	0·018 . .	0·010 . .
D. . .	1·620 . .	0·032 . .	0·014 . .
E. . .	— . .	— . .	0·012 . .
(I.) F. . .	1·383 . .	0·030 . .	0·012 . .
(II.) F. . .	1·324 . .	0·025 . .	0·014 . .

The precipitate insoluble in acetic acid, contained in every instance a large proportion of iron, but in some cases, at least, did not consist wholly of phosphate of iron. On deducting the quantity

of phosphate of iron from the total phosphates insoluble in acetic acid, there remains a residue of some five or six milligrams. It would therefore appear that unalumed bread is liable to contain a minute trace of alumina, which expressed as phosphate of alumina ($\text{Al}_2\text{O}_3 \cdot \text{P O}_5$), equals five or six milligrams per 100 grams of bread, or 0.005 per cent. If the alum corresponding to this phosphate be calculated, it will be seen that 100 grams of unalumed bread may appear to contain 0.022 gram of alum; or expressed on the four lb. loaf, there may appear to be six grains of alum in it. This agrees very fairly with Dr. Dupré's observation recorded in the *Chemical News*.

The author has likewise made some experiments on bread artificially alumed in the laboratory. The sample F was taken and dosed with a solution of ammonia-alum of known strength, and the following results were obtained: as in the former experiments, 100 grams of bread were burnt up.

	Bread-ash.	Si O ₂ .	Precipitate Insoluble in Acetic Acid.	Alumina added.	Or Phosphate of Alumina.
	Gram.	Gram.	Gram.	Gram.	Gram.
I.	1.481	0.034	0.026	0.010	0.024
II.	1.538	0.029	0.041	0.020	0.048
III.	1.496	0.030	0.110	0.040	0.095

The quantity of phosphate of iron yielded by 100 grams of F before alum was added was about eight milligrams. After the addition of alum and ignition, there appeared to be a diminution of phosphate of iron. Possibly this diminution was owing to the chloride of ammonium derived from the alum and common salt in the bread acting on the phosphate of iron at a red-heat, and forming perchloride of iron, which would volatilize. From the above it is manifest, that although there is a little irregularity in the quantities of phosphate of alumina obtained from alumed bread, still the difference between alumed and non-alumed bread is quite distinct. In investigating some samples of bread suspected of being alumed, Mr. Wanklyn found 0.039 gram of insoluble phosphate in one case, and 0.049 gram, and 0.059 gram in other cases. The iron present in every instance was ascertained to be very small in quantity.

A New Method of Detecting and Estimating Alum in Bread and Flour. J. C. Thresh. (*Pharm. Journ.*, 3rd series, v., 885.) The author states that this process requires only a few hours, and quotes experiments showing the accuracy of the results.

Take 1250 grains of bread (from middle of loaf) or flour, and char

thoroughly in a platinum dish or on foil over a gas lamp. Powder the char and mix it with sufficient pure strong hydrochloric acid to make a thin cream. Boil gently for a few minutes, then add 100 c.c. of water, and continue the ebullition a few minutes longer. Dilute to 150 c.c., stir well, and filter off 120 c.c., which will contain the alumina from 1000 grs. of the bread or flour. To this filtrate, add a slight excess of solution of ammonia, boil for a few seconds, then let the precipitate subside, and decant the supernatant fluid. Add boiling water to the sediment, and again set aside to settle, and decant the clear fluid. Pass the fluids through a small filter to collect any particles of the precipitate which may have been suspended therein, and throw the filtrate away. Now add to the partially washed precipitate about a gram of pure caustic potash (or soda), warm, and pass the solution through the same filter employed for the previously decanted fluids. Wash the filter with hot water, to which a little KHO may be added, and proceed to precipitate the alumina in the filtrate by adding a few drops of dilute phosphoric acid and excess of pure acetic acid. Heat the solution and precipitate to the boiling point, and then wash the latter by decantation and filtration. Finally dry, ignite, and weigh. The weight of the resulting AlPO_4 in grams, multiplied by 400, will give the amount of ammonia alum in grains present in one pound of the bread or flour.

The Detection and Distinction of Artificial Colouring Matters in Red Wines. M. Mellies. (*Zeitschr. für Analyt. Chem.*, 1875, 212; *Pharm. Centralhalle*, xvi., 34.) Mix 5 to 6 c.c. of the wine to be tested, with three fourths of its volume of ether in a glass tube closed at one end and capable of holding about 20 c.c., and allow the mixture to stand until the ether has completely separated. If the ethereal stratum appears yellow, and assumes a red colour on the addition of a few drops of solution of ammonia, the wine contains the colour of logwood. If the ether appears red or violet, and retains its colour on the addition of much ammonia, dyer's moss is indicated. If the red-coloured ether loses its colour on the addition of ammonia, without changing to violet, the wine contains none but its natural colour. If the red-coloured ether loses its colour on the addition of solution of ammonia without imparting any colour to the latter, fuchsin is present. Should the ethereal stratum appear colourless, a fresh portion of the wine is mixed with twice its volume of water and half its volume of solution of ammonia; a brownish red coloration indicates cochineal, whereas a green coloration points to the absence of all the substances mentioned.

Detection of Artificial Colouring Matter in Claret. E. Dietrich. (*Archiv der Pharmacie*, 1874, 2nd series, 463.) A mixture of genuine claret with 50 volumes of water shows a pale red colour; an artificially coloured wine, when similarly diluted, appears distinctly blood red. The author has tried the effect of various reagents on genuine and sophisticated wines, and obtained the following results:—

Reagents.	Genuine Wine diluted with 20 vols. of water.	Sophisticated Wine diluted with 20 vols. of water.
Solution of Acetate of Lead, 1 in 10.	The colour disappears; the mixture is turbid, and deposits on heating silver grey or pinkish grey flakes.	A separation of large violet-blue flakes takes place, more especially on heating.
Solution of Sulphate of Copper, 1 in 10.	The colour almost disappears, and the mixture remains clear.	Violet-blue coloration, and slight turbidity.
Solution of Baryta, 1 in 10.	The colour almost disappears, and the mixture is slightly turbid.	Violet-blue or bluish green coloration and slight turbidity.

No mention is made of the kind of colouring matter present in the sophisticated wine.

Detection of Adulteration in Coffee and Tea. A. H. Allen. (*Chem. News*, xxix., 123, 167, 189, 221, and xxx., 2.)

COFFEE.

A preliminary examination should be made in the case of coffee by straining the powder on the surface of cold water. Coffee floats, while chicory quickly sinks. On stirring, coffee very slightly colours the liquid, chicory imparts a dark brown colour. The amount of ash in genuine coffee does not exceed 4·5 per cent; chicory yields 5 per cent. The silica in coffee-ash never exceeds 1 per cent., while in chicory it varies from 10–36 per cent. The average soluble ash in coffee is 3·24, while in chicory it is 1·74 per cent. By determining the soluble ash, S, the percentage of pure coffee, C, may be calculated thus:—

$$C = 2 \left(\frac{100S - 174}{3} \right).$$

The density of coffee-infusion is determined by heating the powder with 10 times its weight of cold water, raising the liquid to the boiling point, filtering, and taking the gravity at 15·5° C. Taking the

density of pure coffee infusion at 1008.6 and that of chicory at 1020.6, the percentage of pure coffee, C, in the sample may be calculated from the equation $C = \frac{100(1020.6 - D)}{12}$ where D represents the density of the infused sample. The relative tinctorial power of an infusion of a sample of coffee is determined by boiling a given weight with 20 c.c. of water for a few minutes, filtering, and again boiling the residue until thoroughly exhausted. An equal weight of a standard mixture of equal parts of pure coffee and chicory is treated in a precisely similar manner. The standard solution is made up to 200 c.c., that of the sample to 100 c.c.; 10 c.c. of the latter are put into a narrow burette, and some of the standard into a test tube of exactly equal bore. If the tints are exactly the same, the sample consisted of pure coffee; if chicory is present, water must be added to the sample until the tints are the same. Each c.c. of water represents 5 per cent. of chicory. The presence of leguminous seeds or cereals may be detected by boiling the sample with animal charcoal and water, filtering, and testing for starch in the cold liquid with iodine. Neither coffee nor chicory contains starch.

TEA.

The adulterations of tea are arranged by the author under four heads.—

1. *Mineral Additions for increasing Weight or Bulk.* (a) Magnetic matter. Detected by drawing a magnet under a weighed portion of the tea spread upon paper, whereby the magnetic matter is separated from the tea, and may be weighed.

(b) Siliceous matter. The ash must be estimated by igniting a weighed portion of the tea. The ash of genuine tea varies from 5.24 to 6.0 per cent. The ash is then boiled with water, the insoluble part again treated with hydrochloric acid, and the silica collected and weighed. Genuine tea does not contain on an average more than 0.30 per cent. of ash insoluble in acid; adulterated teas sometimes contain as much as 10 per cent.

2. *Organic Adulterations for increasing Weight or Bulk.* (a) Exhausted tea-leaves. Best detected by estimating the tannin, gum, soluble ash, insoluble matter, etc.

a. Tannin. 5 grams of lead-acetate are dissolved in 1 litre of water, and the solution filtered after standing; 5 mgms. of pure potassium ferrieyanide are dissolved in 5 c.c. of water, and an equal bulk of strong ammonia solution is added. The lead solution is standardized by diluting 10 c.c. to 100 c.c. with boiling water, and

adding to it from a burette a solution of 0.1 pure tannin in 100 c.c. of water, until a few drops when allowed to fall through a filter on to a drop of the ferricyanide solution spotted on a slab, produce a pink colour. A solution of the tea is made by repeatedly boiling about 2 grams of the finely-powdered sample with 80 c.c. of water, until it is completely exhausted. The solution is filtered and made up to 250 c.c., and used as already described. The amount of tannin in genuine black tea averages about 10 per cent. A small quantity of tannin, about 2 per cent., remains in the exhausted leaves. The percentage of exhausted leaves, E, in a sample may be estimated when the per cent. of tannin, T, is known, by the equation,—

$$E = \frac{(10-T) 100}{8}$$

β. Insoluble matter is best estimated by boiling the pounded sample repeatedly with water, and drying the residue at 120° C. until the weight is constant. The insoluble matter in black tea varies from 46.7 to 53.6 per cent.; while in previously infused leaves it varies between 72 and 75 per cent.

γ. Gum. The aqueous decoction is evaporated nearly to dryness, the residue treated with methylated spirit, filtered, washed with spirit, rinsed off the filter with hot water, the liquid evaporated at a steam heat, weighed, ignited, and weighed again. The loss represents gum.

δ. Soluble ash. The aqueous solution of the ash is evaporated, gently ignited, and weighed. Genuine tea contains not less than 3.0 per cent. of soluble ash, while in exhausted leaves this item falls as low as 0.52 per cent. If S represents the percentage of soluble ash, the percentage of exhausted leaves, E, may be approximately found in the absence of foreign leaves by the equation,—

$$E = (6 - 2 S) 20.$$

(b) Foreign leaves. The presence of leaves other than those of the tea plant may be detected with some accuracy by estimating the insoluble matter, tannin, gum, and ash; but the microscope must decide this question.

3. *Adulterants for imparting a Fictitious Strength.* (a) Extraneous tannin matters, such as catechu, etc., are detected by an unusually high percentage of tannin, as indicated by the lead process. Tea adulterated with catechu gives an infusion which quickly becomes muddy on cooling. 1 gram of the sample and 1 gram of a pure tea are each infused in 100 c.c. of water; and the solutions poured off from the

leaves are precipitated while boiling with a slight excess of neutral lead acetate, filtered, and tested as follows:—About 20 c.c. of the pure tea infusion when gently heated with a few drops of silver nitrate, gives a slight cloudiness only; while tea containing catechu gives a copious brownish precipitate, and the liquid acquires a distinct yellow tinge. One drop of ferric-chloride gives a light green colour if catechu is present, and a greyish green precipitate on standing; the solution from pure tea gives a reddish colour with ferric chloride, due to acetate, and no precipitate on standing. These tests are applicable only when catechu is present in tolerably large quantities.

(b) Lie tea, when thrown into hot water, falls to powder, because the gum or starch used to keep it in a compact form is dissolved. The liquid may be acidified with sulphuric acid, decolourised by permanganate, and tested for starch. The ash of lie tea is often as high as 30 or 40 per cent.

(c) Caper tea is made up into little glossy masses by the aid of gum or starch; it is usually much adulterated. The insoluble matter is usually much less than in genuine tea; the gum amounts to 15 or 20 per cent. The soluble ash often falls below 2 per cent.

(d) Soluble iron salts are added to give an appearance of strength by the formation of tannate of iron. They are detected by shaking the powdered leaves with cold dilute acetic acid, filtering, and testing for iron in the filtrate.

(e) Alkaline carbonates are sometimes added to tea. The soluble ash gives the yellow sodium flame if sodium salts have been added; the alkalinity may also be determined in the soluble ash. The average amount of potash (K_2O) in tea is about 1.62 per cent.

4. *Facing and Colouring Materials.* These may be detected under the microscope, or the leaves may be washed with warm water, the colouring matter collected and examined. Indigo is best detected by the microscope; Prussian blue by boiling with caustic alkali, filtering, and testing for ferrocyanide by ferric chloride. The residue insoluble in alkali, is fused with alkaline carbonate, evaporated to dryness with hydrochloric acid; the residue tested for silica, and the filtrate tested for lime and magnesia.

Moisture varies from 6 to 8 per cent.

Detection of Adulteration in Mustard. A. H. Allen. (*Chem. News*, xxx., 116.) Genuine mustard consists of the mixed flour of black and white mustard seeds, without any addition of farina or colouring matter. The black and white mustard exhibit essential differences in their composition, as is seen in the following recent analyses by Dr. Hassall:—

	Brown Mustard. Per cent.	White Mustard. Per cent.
Moisture	4.84	5.36
Fixed Oil	35.70	35.78
Myronic Acid	4.84	None
Myrosin and Albumen	29.54	27.48
Sinapine Hydro-sulphocyanate	3.59	10.98
Cellulose	16.76	16.29
Ash	4.73	4.11
	<hr/> 100.00	<hr/> 100.00

The usual additions to mustard are foreign farinas (wheat flour is the most common) for increasing the weight and bulk, turmeric as a colorant, and cayenne for imparting a fictitious strength. The detection of wheat or other foreign farina in mustard presents no difficulty, as mustard contains no starch naturally, and therefore the production of a blue colour on adding solution of iodine to the cold aqueous infusion of the sample, infallibly indicates adulteration. The kind of starch present is of course ascertained by the microscope, which also gives a rough idea of its relative amount.

It will be seen from the above analyses by Hassall, that both brown and white mustard farinas contain a large proportion of fixed oil, and the amount is practically the same in both varieties. It varies between 33.9 and 36.7 per cent. The average amount according to the author is 35.1 per cent.

The extent of the adulteration of any sample of mustard can therefore be very fairly ascertained by estimation of the percentage of oil. This is done by exhaustion with benzol or ether. 2 grams of the sample are treated in a flask with about 30 c.c. of commercial benzol, the flask attached to a reversed Liebig's condenser, and the liquid boiled gently, and filtered into a flask after cooling. The process is repeated till the mustard is thoroughly exhausted, when the benzol holding the oil in solution is distilled off, and the residue heated to 130° C. till it ceases to lose weight, when the remaining fixed oil is weighed. If the proportion of oil in genuine mustard is taken at 35 per cent., the percentage of oil in the sample, multiplied by 2.857, will be the percentage of real mustard present.

Some chemists determine the amount of admixture in mustard by estimating the sugar produced by boiling the sample with dilute acid. This method involves the assumption that the flour added is constant in composition; and the fact that glucose is one of the products of the decomposition of myronic acid has been altogether lost sight of.

Turmeric is readily recognized under the microscope by its characteristic structure, and its yellow colour, changed to blue by

iödine. It may also be detected with great readiness by the following test :—About one gram of the sample is boiled with methylated spirit, and filtered. The yellow tincture is evaporated in a capsule at a steam heat, and, when concentrated, a small piece of filter paper (the size of a penny) is immersed in the liquid, the evaporation of which is carried to dryness. The paper is then moistened with a saturated aqueous solution of boric acid, when, after re-evaporating, the paper will acquire a reddish colour if turmeric be present. As a further proof, caustic potassa or soda should be dropped on it, when a very beautiful series of colours will be produced, green and purple being the most prominent. On adding hydrochloric acid a red colour is produced, which is again turned green and blue on addition of excess of alkali. The colours are very vivid and characteristic, pure mustard giving no such result.

The fluorescence of the tincture also serves for the detection of turmeric. It seems very questionable whether turmeric is ever mixed with mustard in sufficient quantity appreciably to affect the weight or bulk of the article ; but its recognition is sometimes important, as it is not added to genuine mustard, and therefore adulteration of some sort may be inferred from its presence.

Gamboge is said to be sometimes used for colouring mustard. It does not give the turmeric reaction, but is turned red by alkali, and restored to yellow by addition of acid. The purgative properties of gamboge render its employment as a colouring matter very undesirable.

Cayenne Pepper, or *Capsicum*, is often added to adulterated mustard to increase its pungency. It is recognizable by the microscope, and also very readily in the following manner :—The mustard is treated with spirit as in testing for turmeric, the tincture is evaporated, and the extract tasted, when the pungent biting flavour of cayenne will be readily perceived. A still more striking test is to heat the dry alcoholic extract, and smell the fumes, when if cayenne is present, an overpowering heat in the lungs, irresistibly compelling coughing, will be perceived. The fumes from pure mustard are not irritating, but ginger produces a somewhat similar effect.

"*Terra Alba*," or *Plaster of Paris*, was at one time used to a considerable extent for adulterating mustard. Its presence would be detected on estimating the ash, which is always below 5 per cent. in mustard free from mineral adulterations. *Chalk* is said to have been employed as an adulterant of mustard, and *chrome-yellow* for colouring.

"*Charlock*," or wild mustard seeds, are sometimes used. Their

employment can scarcely be called an adulteration, and their detection is extremely difficult even with the microscope.

A New Method of Determining the Fusing Point of Fats. A. Angell and O. Hehner. (From the authors' pamphlet on *Butter, its Analysis and Adulterations*.) The deficiencies of the methods hitherto used for estimating the fusing points of fats, render them of little value if employed for the detection of foreign fats in butter. It is evident, however, that if chemists can agree always to take the same point as the fusing point, something like constancy may be obtained. The authors showed that such a point can be easily fixed.

If a weight be placed upon the top of the cold fat, the fusing point of which is to be estimated, it will sink as soon as the fat is so far liquefied as to present less resistance than the weight can overcome.

If this sinking be found constant, and a given weight be universally used, reference tables of relative sinking or fusing points may be constructed for all fats; and if mixtures of fats be found to behave in accordance with the figures set down in these tables, then the qualitative and percentage composition of a given mixture may be approximately estimated.

The most convenient form of weight is that of a glass bulb containing mercury, the gravity of which is of course arbitrary: all our figures are, however, based upon one weight, and of course, if our tables are to be of any use, that same weight must be adopted.

The bulb is made by blowing a small globe on the end of a piece of glass tubing of $\frac{1}{4}$ inch outside diameter, and drawing it off with a tapering neck, very near the bulb. By this means a pear-shaped float is obtained. Sufficient mercury should be introduced to cause the bulb to weigh 3.4 grams, which is the weight of the bulb used in our experiments.

The bulb should displace, as near as possible, 1 c.c. of water, when immersed in a burette. Absolute accuracy is not necessary, since it was found that a slight difference—say from 5 to 10 milligrams—in weight, or a little variation in shape, does not materially affect the results.

Butter and mixtures of it with other fats are the fatty substances with which food analysts will have mostly to deal: the authors' researches have, therefore, been pushed in that particular direction, and only those fats have been tested which are likely to be used as adulterants of butter.

By using such a weight as that described above, the sinking point of all butters comes within the limits of three degrees, and any number of observers witnessing an experiment would agree when to read

the thermometer. Beef, mutton, pork, and other fats, are also equally constant, provided that they are taken from the same part of the animal.

To take the sinking point of a butter, place 20 or 30 grams in a dish or beaker, and melt in the water bath; when quite fluid pour into a test tube, of $\frac{3}{4}$ inch interior diameter and about six inches long, until filled to within about two inches of the top. Keep the tube warm until the whole of the water, casein, and salt has sunk, and left a *perfectly clear fat*; now solidify, by immersing the tube in water of 15° C. temperature. Immerse the tube containing the sample in cold water, contained in a beaker of the capacity of 1 litre: the top of the fat must be about $1\frac{1}{2}$ inches below the surface of the water. A convenient method of fixing the tubes in position is to pass it through a hole drilled in a piece of wood, and placed across the top of the beaker; by this means two or more sinking points may be taken at the same time. Having fixed the tube in an upright position, drop the bulb on to the surface of the fat. The arrangement is now complete, and heat may be applied by means of a Bunsen burner, raised so as to just touch the sand bath. The water should now be stirred at intervals, and the thermometer read off just as the whole of the globular part of the bulb has sunk beneath the fat.

The following results have been obtained by this method previous to the month of August last year, and many other samples of pure butter have since been tested, with a like result: the numbers are placed without selection, in the order in which they were obtained:—

Sinking Point with Genuine Butters.

Butter from town-fed cows	35.3° C.
„ Hertfordshire	36.1
„ St. Lawrence	34.8
„ Chale	36.3
„ Newport	35.3
„ Ventnor	35.3
„ „ No. 2	35.5
Farm butter from Niton	34.8
Fresh „ Ventnor	35.1
Farm butter from Chale	35.6
„ „ „	36.3
Rancid butter	35.8
Farm butter from Chale	36.3
„ „ Ventnor	35.5
„ „ „	34.8
Sussex butter	35.5
Normandy butter	35.7

Sinking Point with Genuine Butters (continued).

Butter from Ventnor	36.1° C.
" " " " " "	35.3
Jersey butter	35.3
Butter from Guildford	35.7
" " " " " "	35.3
Salt butter from Ventnor	35.9
" " " " " "	34.8
Average of twenty-four samples	35.5
(Varying from 34.3° to 36.3°.)	

Adulterated Butters.

I. Butter from Ventnor, 1s. 2d. per lb.	35.9°
II. " " London, " " "	42.7
III. Kiel butter, 1s. per lb.	38.4

No. 1 was found to contain 32.83 parts of genuine butter and 67.17 of foreign fat, the sinking point of the mixture being normal: the fat used as adulterant had, therefore, a sinking point very near that of genuine butter, and was probably dripping or some prepared fat.

Sinking Point of Fatty Acids from Butter.

I.	41.8° C.
II.	42.1
III.	40.5
IV.	41.1

Sinking Point of Fats other than Butter.

Tallow from candle	53.3°
Butterin (patented)	31.3
Ox fat	from 48.3 to 53.0
Mutton fat	from 50.1 to 51.6
Lard	from 42.1 to 45.3
Dripping	42.7
" from beef	43.8
" " "	44.5
" veal	47.7
" mixed	42.6
Cocoa butter	34.9
Palm oil	39.2
Stearin	62.8

Sinking Point of Mixtures.

	Found.	Calculated.
66.7 per cent. butter and 33.3 tallow	43.1°	42.0°
73.0 " " 27.0 mutton fat	42.3	40.2
10.0 " " 90.0 "	48.8	49.6
85.0 " " 15.0 ox fat	38.1	38.1
69.8 " " 30.2 "	39.5	39.8

To calculate the sinking point of a mixture of known composition, multiply the percentage of the first constituent, and also that of the second constituent by its own sinking point, and divide the sum of the two products by the sum of the percentages of the two constituents; or in formula:—

F being fat, and S sinking point,

$$\frac{F_1 \cdot S_1 + F_2 \cdot S_2}{F_1 + F_2}$$

If butter be one constituent in the mixture, the formula will be somewhat modified, inasmuch as butter contains, besides fat, on an average, 15 per cent. of water, curd, and salt, which being removed by fusion, must not be admitted into the calculation.

One part of butter, therefore, is equal to 0.85 part of fat; the percentage of the butter present in the compound must consequently be multiplied by 0.85, to give per-cents. of butter fat, thus:—

$$\frac{0.85 \cdot B \cdot 35.5 + F \cdot S}{0.85 \cdot B + F}$$

The Analysis of Butter Fats. A. Angell and O. Hehner. (From the authors' pamphlet on *Butter, its Analysis and Adulterations*.) The authors' method is based upon the fact that pure butter fat contains 85.8 (85.4 to 86.2), per cent. of insoluble and non-volatile fatty acids, whilst other fats such as can be used for the adulteration of butter, contain 95.5 (95 to 96 per cent.), thus showing a difference of 9.7 per cent. The estimation is performed in the following manner:—

The butter is freed from water, salt, and curd, and a weighed quantity of the pure fat (about 3 grams) saponified in a porcelain basin with a concentrated solution of potash. By boiling the mixture gently, and stirring it well with a glass rod, the saponification is soon completed and yields a perfectly clear soap. The evaporating water should be replaced by distilled water so as to keep the liquid about 150 to 200 c.c. The soap is then decomposed by dilute hydrochloric acid; the fatty acids thus separated are fused in the liquid, then filtered through a weighed and well-moistened filter, well washed with boiling water, dried at 100° C., and weighed. Each per cent. found above 85.5 indicates 10.36 per cent. of foreign fat, in the fatty portion of the butter. In calculating the actual percentage of adulteration in the butter under examination, it should be borne in mind that on an average 85 parts of butter fat (free from water, salt, and curd), represent 100 parts of butter.

With regard to butter fats the following experiments are quoted to prove their constant composition.

1. Three grams of genuine farm butter-fat yielded 2.567 grams, or 85.56 per cent. of fixed fatty acids.

2. 3.159 grams of butter-fat yielded 2.922 grams, or 86.16 per cent., of fixed acids.

3. 3.170 grams of another sample gave 2.717 grams, or 85.71 per cent.

4. 3.257 grams of fat from salt butter gave 2.796 grams, or 85.84 per cent.

5. 4.043 grams of fat from fresh Sussex butter yielded 86.20 per cent. of fatty acids.

6. 3.302 grams of fat from Normandy butter yielded 3.076 grams, or 85.40 per cent.

7. 3.027 grams of Jersey butter-fat gave 2.606 grams of fatty acids, equal to 86.09 per cent.

8. 2.812 grams of fat from another Jersey butter yielded 86.13 per cent. of insoluble fatty acids.

9. 3.108 grams of butter-fat from Guildford gave 86.06 per cent. of fixed acids.

10. 3.244 grams of butter-fat yielded 2.772 grams, or 85.48 per cent.

11. To see how far the quantity of fatty acids may be influenced by rancidity, 3.00 grams of a strongly rancid butter-fat were saponified. Obtained 2.567 grams, or 85.57 per cent., of insoluble fatty acids; thus proving that rancidity does not materially interfere with the accuracy of the method.

Experiments made with mixtures of pure butter and known quantities of foreign fat, show that the method described, gives fairly accurate results.

Milk. C. A. Cameron. (*Chem. News*, xxi., 54; *Journ. Chem. Soc.*, 2nd series, xiii., 457.) *Colour of Milk.*—Milk rendered slightly alkaline by potash may, by continual ebullition, be deprived of almost every trace of fat, and yet remain a perfectly milk-like liquid. Butter-milk containing 0.5 per cent. of fats is whiter than skimmed milk containing 1.3 to 2.0 per cent. of fats. In the former the caseous envelopes of the so-called fat globules are left, and from the latter a large proportion is removed as cream. From these and other facts, the author concludes that the opacity and whiteness of milk are not due to the liquid being an emulsion of fats, but to the reflection and refraction of light by solid caseous matter suspended in it.

Cow's Milk.—From the results of several thousand analyses of cow's milk, the author states that the mixed milk of town cows

never contains less than 12 and that of country cows 11·5 per cent. of solids; and he agrees with Professor Wanklyn that the solids, minus fats, never fall below 9·3 per cent. Forty analyses of pure milk from Dublin dairy cows gave the following average results:—

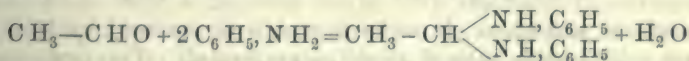
Water	87·00
Fats	4·00
Albuminoids	4·10
Sugar	4·28
Mineral matters	0·62
<hr/>	
	100·00

Mare's Milk.—The author examined the milk of 14 mares, and found the solids to vary from 8·5 to 11·5 per cent., the fats from 0·6 to 2·12 per cent.; the casein from 1·46 to 2·4 per cent.; the sugar from 5·67 to 6·87 per cent.; and the mineral matter from 0·33 to 0·44 per cent. The average of the 14 samples gave:—

Water	90·310
Fats	1·055
Albuminoids	1·953
Sugar	6·285
Mineral matters	0·397
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	100·000

Mare's milk is bluish white, of sp. gr. about 1·031, and has a neutral or faintly alkaline reaction.

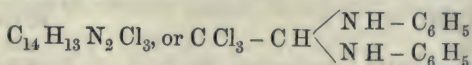
Some Reactions of Chloral. O. Wallach. (*Annal. der Chemie*, clxxiii., 274–288; *Journ. Chem. Soc.*, 2nd series, xiii., 349.) Maumené has stated (in a paper read before the Paris Chemical Society, in 1870, and reported in the *Deut. Chem. Ges. Ber.*, iii., 246) that the product of the action of chloral on aniline is an uncrystallizable base, $C_{10}H_5NO_2$. This is the more surprising since the aldehydic nature of chloral would lead one to expect a reaction similar to that of aldehyde, which Schiff has shown to be,—



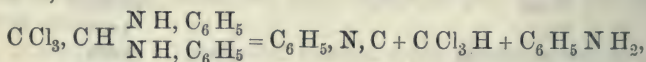
The author's investigation of this reaction leads him to a result different from that of Maumené. He finds that the action of chloral and aniline is in every way similar to that of aldehyde and aniline.

Aniline and Chloral.—If aniline and anhydrous chloral be brought together, a violent reaction takes place, and it is necessary to cool the mixture. The product is a thick liquid, which slowly becomes crystalline. If the mixture is not kept sufficiently cool, or if the

proportions are not correctly chosen, the product takes several days to crystallize, and is difficult to purify. After recrystallization from alcohol, fine tables with well-developed faces are obtained, which on analysis give numbers corresponding with the formula,—

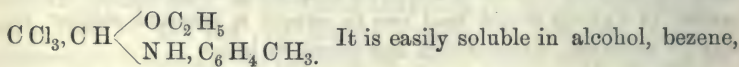


This body the author names *trichlorethylidene-diphenyldiamine*. It is easily soluble in alcohol, ether, benzene, and chloroform, but insoluble in water. It melts at 100° – 101° , and is decomposed at 150° . On boiling with water, or even on prolonged heating with alcohol, it is decomposed, with formation of phenyl cyanide. The same product is formed by the action of aqueous solutions of the alkalis, slowly in the cold, more rapidly when heated, and instantly with an alcoholic solution of potash; no chloroform could be detected among the products of decomposition. The author thinks that the first reaction is,—



and that the chloroform at once reacts with the aniline to form another molecule of phenyl isocyanide. The body does not appear to act as a base; its solution in alcohol has a neutral reaction, and gives the double chloride of platinum and aniline on treatment with hydrochloric acid and platinum chloride.

Toluidine and Chloral.—Toluidine (melting at 45°) dissolves readily in chloral, with evolution of heat, and the mixture solidifies on cooling. The product thus obtained is, however, difficult to purify, and it was found advisable to use solutions of the two substances in ether, rather more than the theoretical quantity of chloral being taken. The new body, trichlorethylidene-ditolylldiamine, has the formula



chloroform, and ether. It melts in and is decomposed by boiling water. With acids, salts of toluidine are formed. This compound is produced, together with the preceding, by leaving an alcoholic solution of one molecule of chloral and one molecule of toluidine in a warm place for several days. Chloral alcoholate and toluidine fused together produce the first compound only, or at most a mixture of the two. No similar bodies could be obtained with methyl alcohol, or with the aniline or xylylidine compounds. The body $\text{C}_{11}\text{H}_{14}\text{Cl}_3\text{NO}$, heated with absolute alcohol, does not produce trichloroacetal; neither

does acetal yield any similar products on heating with aniline or toluidine.

Xylidine and Chloral.—Xylidine (boiling at 212° – 216°) and chloral yield a product similar to that from aniline and toluidine. The compound crystallizes in fine needles, soluble in ether and alcohol, and has the formula, $C Cl_3, CH \begin{matrix} \swarrow \\ \searrow \end{matrix} \begin{matrix} NH, C_6H_3(C_6H_5)_2 \\ NH, C_6H_3(C_6H_5)_2 \end{matrix}$. Its melting point lies between 95° and 99° , whereas the aniline and toluidine compounds melt at 100° and 114° respectively. The low melting point is due, the author thinks, to the presence of isomeric or homologous bases in the xylidine used.

The Salts of Aromatic Bases and Chloral.—Aqueous solutions of aniline hydrochloride and chloral do not react in the cold, but the dry salt is at once dissolved in great quantity by fused chloral hydrate. The mass becomes green, and when treated with water leaves a green amorphous powder, nearly insoluble in cold water, which loses its colour on treatment with ammonia, but regains it with acids. The author was unable to purify this body.

Chloral and Nitrous Anhydride.—If nitrous anhydride be passed into anhydrous chloral, a deep green solution is formed, which does not change on standing. At 100° , however, in sealed tubes, a reaction takes place, and trichloroacetic acid, together with a very large quantity of gas, is produced; chloropicrin in small quantity was also observed. The tubes used should be very strong, and great care taken in opening them.

A New Substance found in Urine after the Internal Administration of Chloral Hydrate. V. Mering and M. Musculus. (*Ber. deutsch. Chem. Ges.*, 1875, 662.) The author's researches on the changes which chloral hydrate undergoes in passing through the organism disprove Liebreich's theory that this body splits up into chloroform and a formate, under the influence of the alkali of the blood. Having tested the breath of chloralized animals for chloroform, with a negative result, they examined the urine of a number of persons who had taken five to six grams of chloral hydrate per night for some time. It contained neither chloroform nor formic acid, but a trace of chloral. It reduced Fehling's solution, but contained no sugar. As the urine was found to turn the plane of polarization to the left, the authors endeavoured to isolate the substance to which this power was due, and succeeded in obtaining it in the shape of stellar groups of colourless silky crystals, having the properties of an acid. This substance is readily soluble in water, alcohol, and in a mixture of alcohol and ether, but

insoluble in pure ether. It is precipitable by the subacetate of lead. The ultimate analysis of the acid, and the examination of its potassium and barium salts led to the formula $C_7H_{12}Cl_2O_6$.

Required.	Found.
C = 31.94	C = 31.6
H = 4.56	H = 4.36
Cl = 26.99	Cl = 26.70
O = 36.51	

After a dose of five to six grams of chloral hydrate, the urine contains about 10 grams of this acid in 1000 c.c. It would appear that chloral hydrate belongs to those substances which, like benzoic acid, combine with some product of the organism, and are eliminated in this combination. The authors propose for this substance the provisional name of urochloralic acid. They also find that after the internal administration of croton-chloral hydrate, and of morphia, the urine likewise reduces Fehling's solution, and turns the plane of polarization to the left.

On certain Compounds of Albumen with the Acids. G. S. Johnson. (Abstract of a paper read before the Chemical Society; *Brit. Med. Journ.*, No. 726, 673.) In testing albuminous liquids, much reliance is usually placed upon coagulation by nitric acid, which is added in excess, and in the concentrated form; if, however, the acid be very dilute, or added in small quantity, the precipitate which first falls is redissolved on shaking, and the acid liquid thus formed is not coagulated by heat, though the albumen is immediately precipitated by a few more drops of the strong nitric acid. This reaction has long been observed in testing albuminous urine. It was with a view to its explanation that the following experiments were conducted.

The whites of four eggs were placed in a hoop dialyzer of parchment-paper, which was floated upon the surface of some dilute nitric acid (sp. gr. 1.0025). After twenty-four hours, the albumen on the dialyzer had become a clear, semi-transparent jelly, soluble in boiling water, yielding a strongly acid solution, in which nitric acid could be detected by the formation of a brown ring on the addition of protosulphate of iron and strong sulphuric acid. The solution of this jelly was not precipitated by corrosive sublimate, silver nitrate, lead subacetate, or alcohol.

When the acid was neutralized by an alkali, the albumen was precipitated. Excess of alkali redissolved the precipitated albumen in the cold, but not if the solution were previously heated above the coagulating point of albumen.

Excess of nitric acid, sulphuric or hydrochloric acids immediately coagulated the solution of albumen nitrate. Dried *in vacuo* over sulphuric acid, the compound became a hard, brittle, transparent mass, resembling gum; and in this form it was hygroscopic, but not deliquescent.

To determine the amount of acid in the compound, the dry nitrate (having ceased to lose weight *in vacuo*) was weighed and dissolved in boiling water. To the acid liquid thus obtained, and coloured by a solution of litmus, a solution of soda of known strength was added from a burette until the acid was exactly neutralized, the point of neutralization being determined by the restoration of its blue colour to the litmus. The acid was then determined by calculation.

Analyses of two samples of the compound, prepared by dialysis over acids of sp. gravities 1.002 and 1.001, yielded concordant results, which showed the presence of 6.7 per cent. by weight of nitric acid in the dry nitrate.

Hence it appears that there is a distinct compound of nitric acid with albumen: and it is the formation of this compound which explains the absence of any precipitate on heating albuminous urine to which a small quantity of nitric acid has been added. Similar compounds were obtained by dialyzing white of egg over the other mineral, and some of the best known vegetable acids. Each acid, however, imparts some characteristic reaction to the albumen, by which its compound may be distinguished from all the others; and the proportions of acids in the different compounds vary according to their several combining weights.

Estimation of Nitric Acid by Indigo. F. Fischer. (*Dingl. polyt. Journ.*, ccxiii., 423-427; *Journ. Chem. Soc.*, 2nd series, xiii., 481.) Indigotin prepared by reduction of indigo by means of grape sugar, alcohol, and caustic soda, oxidation in the air, and solution in sulphuric acid, may be kept unchanged for years. Five c.c. of such a solution, diluted with water, and mixed with 30 c.c. of pure sulphuric acid, is titrated by adding a standard nitric acid solution, until the blue colour gives place to a light green; the indigo solution is then diluted, so that 1 c.c. shall be equal to .0025 milligram-equivalents of nitric acid, or 0.2525 milligram of potassium nitrate. If a water is being examined it is run into 4 c.c. of the titrated indigo solution, mixed with 20 c.c. sulphuric acid, until the blue colour changes to light green. Ten, divided by the number of c.c. of water used, expresses the milligram-equivalents of nitric acid per litre; thus, if 4 c.c. of water are used, there are 2.5 milligram-

equivalents of nitric acid, equal to 252·5 milligrams of potassium nitrate per litre. If a preliminary test with brucine has shown that the water contains very little nitric acid, 2 c.c. only of the indigo solution must be used, or sometimes as little as 1 c.c. If more than 8 c.c. of water is required to destroy the blue colour, 100 c.c. must be evaporated down to the volume of 8 c.c., and then titrated. The volume of sulphuric acid added must be at least double the sum of the volumes of indigo and water; the temperature must not sink under 110°.

Reductions of Metallic Oxides by Hydrogen as a Means for the Separation and Quantitative Estimation of Metals. W. Müller. (*Pogg. Ann.*, cliii., 321-343; *Journ. Chem. Soc.*, 2nd series, xiii., 381.) The reduction of the oxides of platinum, gold, silver, mercury, lead, copper, antimony, arsenic, tin, nickel, cobalt, iron, and manganese begins at a certain temperature, which is constant for each metal, and thus affords a means of separating them from each other.

The apparatus consists of a bent glass tube, with the shorter limb closed at the end, so that it can be placed on a sand bath, or immersed in paraffin, while the longer limb is open, and graduated into cubic centimetres. The tube is placed perpendicularly, with the oxides to be reduced in the closed limb, and the air is then removed by means of an india-rubber tube from the longer limb, which dips into water. The oxygen of the air in the shorter limb is removed by the introduction of a piece of phosphorus, or better by a little platinum black. Hydrogen is then introduced, and the necessary heat applied. The quantity of hydrogen used at each temperature is measured by the rise of the water in the longer limb. The following is an example of the results obtained:—

A mixture of the oxides of copper and zinc, prepared from the nitrates, and weighing 0·552 gram, was placed in the tube, and heated by a spirit lamp, but not to redness. The temperature of reduction of copper oxide is 135°; that of zinc a red heat. At the end of five hours the volume of hydrogen remained constant, and the quantity which had disappeared corresponded with 0·034 gram of oxygen, the calculated number being 0·0338 gram. The method can be applied to the following combination of metals:—copper and zinc; copper and silver; copper and bismuth; copper and cadmium; copper and lead; copper and tin; copper and iron; mercury and iron; copper, iron, and zinc; copper, cadmium, and zinc in technical analyses; copper, tin, and zinc; copper, lead, and zinc.

The great drawback of the process is the length of time required.

Possibly this might be remedied by using the nitrates or other salts, instead of the oxides.

Amylogen, or Soluble Starch. L. Boudonneau. (*Comptes Rendus*, lxxx., 671; *Journ. Chem. Soc.*, 2nd series, xiii., 629.) Amylogen, whether prepared by dilute acids or alkalies, or by water under pressure, always possesses the same chemical qualities by desiccation. It becomes translucent with conchoidal fracture, and completely insoluble in both cold and boiling water; but when mechanically divided with a fine file, it is largely dissolved by water; it is always soluble, more or less rapidly according to its state of cohesion, in soda and zinc chloride. The effect of cohesion may be clearly seen in amylogen prepared with soda. If carefully precipitated by alcohol, it is soluble in a small quantity of water; but if the precipitate be simply compressed between the fingers, it becomes almost insoluble. Amylogen is so perfect a colloid, that it may be considered as a type.

The starch granule is made up of concentric layers separated from each other by a cellular membrane. When this membrane is broken up by soda, etc., the starch, coming in direct contact with water, dissolves therein.

On the Preparation of Mineral Kermes. H. Weppen. (*Ber. deutsch. Chem. Ges.*, 1875, 523.) Ferreil stated that only sodium carbonate, but not potassium carbonate, can be employed for the preparation of mineral kermes, as the latter had no action whatever on the black sulphide of antimony (see *Bull. de la Soc. Chim.*, No. 5, 1874). He found that in all cases in which he succeeded in obtaining any kermes by means of potassium carbonate, the latter proved on examination to contain some sodium carbonate; and that by the use of perfectly pure potassium carbonate, not a trace of kermes could be obtained. As this view is not in harmony with older statements, the author repeated Ferreil's experiments, employing an absolutely pure potassium carbonate, made by himself from pure potassium sulphate and pure barium hydrate. With this he obtained a quantity of kermes, amounting to 20 per cent. of the black sulphide used. The ordinary purified carbonate of potassium and also that obtained from tartar yielded exactly the same result, which completely disproved Ferreil's allegations.

Purification of Salicylic Acid. A. Rautert. (*Ber. deutsch. Chem. Ges.*, 1875, 537.) It is well known that salicylic acid cannot be sublimed without suffering decomposition, but that in an atmosphere of steam or hot air, it readily volatilizes below its boiling point. Based upon this fact is the author's method for preparing a

pure and snow-white acid from the commercial preparation. The impure acid is heated in a small copper still in a paraffin bath, to 170°C ., and when this temperature is reached, steam of 170°C . is passed over it. The steam is heated by passing it through a worm heated in a paraffin bath, before it is conducted into the still. The salicylic acid which passes over contains a little carbolic acid, from which it is freed by washing and recrystallization from boiling water.

To work this process on a large scale, high pressure steam may be employed in place of the paraffin bath.

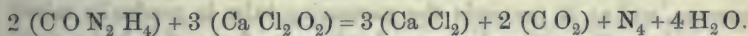
Determination of Tannin. MM. Muntz and Ramsbacher. (*Bull. de la Soc. Chim. de Paris*, Nos. 6 and 7, Oct. 5, 1874; *Chem. News*, xxx., 295.) The principle of the method is as follows:—A solution of tannin, filtered by pressure or aspiration through a piece of hide, gives up to it all its tannin, whilst the rest of the dissolved matters pass through the animal tissue. The authors have satisfied themselves by direct experiment that the matters which may accompany the tannin, such as saccharine and gummy substances, organic salts of potash, lime, magnesia, etc., are not retained by the hide. On evaporating to dryness equal quantities of the solution, filtered and unfiltered, and deducting the weight of the former residue from that of the latter, we find the exact weight of the tannin absorbed by the hide. As an example, 50 grams of oak-bark, ground in a coffee mill, are exhausted with boiling water, so as to make up 250 c.c. of liquid. A piece of hide, free from hair, and previously softened in water, is stretched over a small zinc drum of about 0.06 metre in diameter, and secured in its place with a copper wire. The opposite end of the drum forms a tube, to which is attached a tube of caoutchouc from 1.5 to 2 m. in length, and terminating above in a funnel. Into this is poured the solution of the sample. The first 4 or 5 c.c. of the filtrate are rejected because they contain certain albumenoid matters expelled from the hide by displacement. After having thus collected by filtration a certain quantity of liquid, 25 c.c. of the filtrate are evaporated to dryness at 100° , and also 25 c.c. of the unfiltered solution; we have then—

Weight of tannin and foreign matter	0.465 gram.
Weight of foreign matter alone	0.175 „
	<hr/>
	0.290 „

being the weight of tannin present in 25 c.c. of liquor. The total volume of this liquor being known, and the amount of bark from

which it is obtained, the percentage of tannin in the latter is found by a very simple calculation.

A Simple Apparatus for Estimating Urea. R. Apjohn. (*Chem. News*, xxxi., 36.) A rapid and accurate process for estimating urea is of so much importance, in a medical point of view, that the recent memoir of Russell and West on the subject (see *Journ. Chem. Soc.*, Aug., 1874) has necessarily attracted much attention. The principle of the method they have employed is the same as that suggested many years ago by Davy, viz., that urea when brought into contact with hypochlorite of calcium is resolved into nitrogen, carbonic anhydride and water, in virtue of the following reaction:—



For the hypochlorite of calcium, Russell and West have substituted a mixed solution of hypobromite of sodium and caustic soda, which by a like reaction yields similar products, the carbonic anhydride, however, being absorbed by the caustic alkali. Working with the latter solution, the author has recently made many experiments which have led him to the conclusion, that at a given temperature and pressure a given quantity of urea always yields the same volume of nitrogen. Operating with 0.15 gram of urea, the barometer being at 30, and the thermometer at 60° F., the volume of the nitrogen disengaged and collected over water was found to be 55 c.c., a result almost identical with that obtained by Russell and West.

The apparatus the author has devised for the estimation of the urea is materially different from that employed by Russell and West. It is more simple, more easily worked, and will give results of at least equal accuracy. It also possesses the advantage that the materials for its construction are to be found in every laboratory. They are:—

1. A glass measuring tube of about a foot in length, drawn out at the end, which will be uppermost when the tube is used, like a Mohr's burette, and subdivided into 30 parts of equal capacity, the aggregate volume of which is 55 c.c.

2. A small wide-mouthed gas bottle of about 60 c.c. capacity.

3. A short test tube of about 10 c.c. capacity, and of such height that when introduced into the gas bottle it will stand within it in a slightly inclined position.

The following are the arrangements for combining the apparatus and working an experiment:—

The graduated tube, held in a clamp attached to a retort stand, is depressed into a glass cylinder, nearly filled with water, until the

zero mark, which is near the upper end, exactly coincides with the surface of the water. 15 c.c. of the hypobromite solution (100 grams of Na HO, 250 c.c. of water, 25 c.c. of bromine) having been poured into the flask, the test tube containing the urine is introduced by means of forceps, care being taken that none of its contents shall spill into the hypobromite. The flask is now closed with a very accurately fitting india-rubber stopper, perforated with a hole, in which is inserted a short piece of glass tubing open at both ends, and is then connected with the measuring tube by means of a piece of elastic tubing. It is now inclined so as to allow the urine to mix with the hypobromite. Effervescence at once commences, and as it proceeds the measuring tube is gradually raised so as to relieve the disengaged nitrogen from the hydrostatic pressure. The flask is shaken a few times, and when the reaction is completely over, the apparatus is left for a few minutes, until it has acquired the temperature of the room in which the experiment is performed. Another exact levelling of the measuring tube is made, and the number of the division corresponding to the volume of the evolved nitrogen is read off. Since 55 c.c. correspond to 0.15 gram of urea, a single division corresponds to—

$$\frac{0.15}{30} = 0.005 \text{ gram urea.}$$

Consequently, if n is the number of measures of nitrogen obtained in an experiment, $0.005 \times n$ will represent the amount of urea present. But as the quantity of urea generally experimented on is 5 c.c., if x be the percentage of urea in the urine, $\frac{x}{20}$ will be the urea in 5 c.c. Hence we have—

$$\frac{x}{20} = 0.005 \times n, \text{ and } x = 0.1 \times n.$$

It therefore follows that if 5 c.c. of urine is operated on, each measure of nitrogen evolved will correspond to 0.1 per cent. of urea.

The following results obtained from known quantities of pure urea will give an idea of the accuracy which is attainable by this process:—

C.c. of a 2 p.c. urea solution.	Measures of nitrogen evolved.	Weight of urea taken.	Weight of urea found.
7.4	30.0	0.148	0.150
7.2	28.0	0.144	0.140
6.0	23.8	0.120	0.119
5.0	19.5	0.100	0.097
4.4	17.0	0.088	0.085
4.0	16.0	0.080	0.080
3.0	12.0	0.060	0.060
2.0	8.0	0.040	0.040
1.0	4.0	0.020	0.020

In working with a specimen of urine, three experiments gave on each occasion 3 per cent. of urea. In the case of another specimen, in two experiments the percentages of urea were 3.0 and 3.1.

By using a longer and narrower measuring tube, which would admit of finer subdivision, and by making the necessary corrections in the volume of the gas for temperature, pressure, and the tension of aqueous vapour, strictly accurate results could no doubt be obtained.

The instrument, however, is not intended to yield results of theoretic accuracy, but merely to estimate the urea with sufficient precision for medicinal purposes.

The Chromic Acid Reaction with Alcohol. Dr. F. De Chaumont. (*Brit. Med. Journ.*, No. 727, p. 706.) The author thinks it possible there may be some misunderstanding about the chromic acid reaction with alcohol in the urine. Almost every urine shows a certain amount of reaction, unless it be first distilled and the distillate operated upon. Even then Dupré found a slight indication of some substance giving the reaction when no alcohol had been taken; but the quantity was too small for examination, and its presence has not been detected by Dr. Parkes in his numerous experiments. In undistilled urine, the action is due (in the absence of alcohol) to uric acid, or any other oxidisable matter that may exist there. Finding in some experiments on himself, that the reaction took place in undistilled urine even sixty hours after any alcohol had been swallowed, the author tried the test with a number of oxidisable substances, and found the reaction given by the following:—Uric acid, oxalic acid, oxalate of ammonium, sulphuric ether, benzoic acid, starch, gum-arabic, cane sugar, and milk sugar. There was no reaction with pure urea—a non-oxidisable substance. The reaction, therefore, as a test for alcohol, must be looked for in the distillate of urine only, in which case it may probably be de-

pended upon. At the same time, it is possible that any volatile substance swallowed, and capable of being passed off by the urine, might interfere with it; but, as such substances are generally odorous, the smell of the distillate would probably enable the observer to detect them.

Presence of Copper in the Animal Organism. M. Bergeron and L. L. Hôte. (*Comptes Rendus*, lxxx., 268; *Journ. Chem. Soc.*, 2nd series, xiii., 477.) The kidneys and livers of fourteen human bodies were examined for copper with the following results:—In two individuals aged seventeen years, the presence of copper could only be proved qualitatively; in eleven individuals, aged from twenty-six to fifty-eight years, the quantities of copper found ranged from 0·7 to 1 milligram; and in one individual, seventy-eight years old, the copper amounted to 1·5 milligram. The greatest care was taken not to introduce copper into the liquids to be tested for it; the experiments were conducted in a room from which all copper utensils had been removed; the balance, water bath, and burners used were made of iron.

The quantities of copper found being too small to be weighed, were estimated by the intensity of coloration produced when ammonia was added to their solutions. A scale was formed of liquids of known strength, by comparison with which it was possible to estimate quantities of copper, amounting to more than half a milligram.

The authors think that copper continually finds its way into the human body in consequence of the daily use of copper vessels, copper coins, etc.; that the greater quantity of the metal is again eliminated from the system, but that a minute quantity is retained by the secretory organs, as the kidney and liver, under any conditions of age or sex or mode of living.

Note on the Camphor of *Ledum Palustre*. J. Tropp. (*Ber. deutsch. Chem. Ges.*, 1874, 542.) By distilling water from 1000 lbs. of the leaves of *Ledum palustre*, the author obtained an oil, which, on exposure to air, soon formed a crystalline mass. This substance is insoluble in water, but readily soluble in alcohol, ether, and chloroform; from these solutions it crystallizes in fine prisms. With a drop of nitric acid or sulphuric acid it produces a deep violet coloration; chlorine, bromine, and iodine convert it into a black amorphous mass. On boiling the oil with nitric acid of 1·35 sp. gr. it yields orange-coloured crystals. The analysis of this ledum camphor gave the following figures: C = 83·4, H = 11·4, O = 5·1, which lead to the formula $C_{28}H_{48}O$.

The Boiling-point of Glycerin. A. Oppenheim and N. Salzmann. (*Ber. deutsch. Chem. Ges.*, 1874, 1622, 1623; *Journ. Chem. Soc.*, 2nd series, xiii., 442.) Most handbooks state that glycerin boils with partial decomposition, although Mendelejeff has shown that it boils constantly at 290° . As at that time crystallized glycerin was not known, the authors have again determined the boiling point of pure crystallized glycerin, and found $29\cdot080^{\circ}$ to be the corrected boiling point, the pressure being 756·55 mm. Although the distillation did not proceed quickly, only a small quantity of polyglycerines was left behind.

The Testing of Sulphate of Conchinine. O. Hesse. (*Annal. der Chem.*, 176, 322.) The author's method for ascertaining the purity of sulphate of conchinine, is based on the different behaviour of hydriodate of conchinine to water and ammonia as compared to that of the hydriodates of quinine, cinchonine, and cinchonidine.

0·5 gram of the sulphate to be tested is heated with 100 c.c. of water to $60^{\circ}\text{C}.$; 0·5 gram of pure iodide of potassium is then added, the mixture well stirred, and, after standing for an hour in the cold, thrown upon a filter. If the preparation be pure, the filtrate will remain clear on the addition of a drop of solution of ammonia. The formation of a precipitate would show the presence of quinine, cinchonidine, or cinchonine.

MATERIA MEDICA.

PART II.

MATERIA MEDICA.

On the Javanese Calisaya and on Conchinine. O. Hesse. (*Annal. der Chem.*, clxxiv., 337.) One of the most remarkable facts in connection with the results of the cultivation of cinchona in Java, is that the *Cinchona Calisaya*, grown there for many years, produces a considerable quantity of *conchinine*, which is proportionately larger even than that contained in *Cinchona Pitayensis*, and other cinchonas. It differs herein materially from the *Cinchona Calisaya* of Peru and Bolivia, the bark of which contains chiefly quinine, which as a rule is not found in the Javanese Calisaya. Taking into consideration this difference, together with the fact that a transformation of quinine into *conchinine*, or *vice versa*, does not take place, either in nature or in the separation of these bases from the barks, it must appear doubtful whether this Javanese Calisaya be Weddell's *Cinchona Calisaya*, or perhaps a distinct species.

The author decides in favour of the latter assumption. He is, however, of opinion that this species is not new, originating possibly in cultivation, but was in existence in South America prior to the transplantation of cinchonas from thence to Java; evidently it was then taken to be the true Calisaya. From this it may be inferred, that the botanic characters of both species are alike, or nearly alike, so that the one species might easily be mistaken for the other. The only important distinction would therefore have to be sought in the nature of their constituents.

This cinchona is not to be confounded with that brought to Java by Ledger, as that species yields a bark which, as regards its chemical constituents, corresponds with the true Calisaya bark, and at the present time even exceeds it in the amount of quinine it contains. Influenced by the first impression of these favourable results, J. E. Howard named this cinchona, *Cinchona Ledgeriana*, taking it to be a variety of Weddell's Calisaya. Upon more careful consideration, however, it may yet turn out that the plant is no other than the true Calisaya, and that the large amount of quinine it contains is only attributable to the great care with which at the present time the development of the cinchona is observed and followed up in Java. At the beginning of 1874, there were in Java

72,000 plants of the latter species. Amongst this large number of plants some have become conspicuous by the diversity of their botanical characters, as well as the nature of their alkaloids; but whether this be a degeneration, which would indicate that the so-called *Ledgeriana* is a hybrid, or whether we have here to deal with a species invariable in its characters is still an open question. The amount of conchicine must be considered as characteristic of the original Javanese *Calisaya*. Dr. de Vrij, in 1859, separated this alkaloid for the first time from the bark of this cinchona, and pointed out that what hitherto had been viewed as a decomposition product of quinine was yielded ready formed by nature. In a specimen of this bark from Tjibodas, presented to him in 1873 by this gentleman, the author found in 100 parts—

Conchicine	3.18
Cinchonine	0.16
Amorphous Bases	0.77
Quinine and Cinchonidine	0.00
New Alkaloid	0.00
	<hr/>
	4.11

The conchicine may be here regarded as a product of the oxidation of cinchonine. The chemical and physical behaviour of both alkaloids, almost throughout suggests the near relations existing between them; nevertheless, the artificial conversion of one of these alkaloids into the other has not yet been achieved. Zorn has recently investigated conchicine in this direction. He obtained a compound which was represented to be constituted according to the formula $C_{20}H_{23}N_2OCl, 2HCl$, and to have been formed by the substitution of a complex atom-group of HO by Cl . Zorn thought it might be assumed, that in this respect conchicine behaved in a manner analogous to cinchonine, cinchonidine, and quinine. Unfortunately he has neglected to ascertain what atom-group is capable of passing from the new salt into other combinations, and whether the water, which is represented in the formula given, actually exists. The author thinks that these new substances derived from cinchonine, cinchonidine, and quinine are addition-products, so that Zorn's chlorinchonid = $C_{20}H_{25}ClN_2O$, would be hydrochlorcinchonine, provided that it cannot be referred to cinchonine.

As regards conchicine, however, the reaction proceeds in a manner essentially different from the last mentioned case. If sulphate of conchicine be treated with hydrochloric acid, according to Zorn's directions, hydrochloric acid takes the place of the sulphuric acid,

and a conchinine salt, the bihydrochlorate, is obtained. This salt forms nice colourless prisms, which, by recrystallization from moderately concentrated warm hydrochloric acid, may easily be obtained free from the least trace of adhering sulphuric acid. The crystals are easily soluble in alcohol, less so in water, hydrochloric acid, and chloroform. Their fluorescent aqueous solution produces, upon the addition of chlorine water and an excess of ammonia, the well known green colour.

At from 100° to 120° C., this salt loses from eight to nine per cent., consisting of the water of crystallization and hydrochloric acid; the dried residue, when dissolved in water, still has an acid reaction.

0.211 grain of air-dried substance, after being dried in the exsiccator (whereby no loss was occasioned), and being heated to 100° C., and afterwards to 120° C., until the weight remained constant, lost 0.0185, equal to 8.76 per cent. The residue was then dissolved in water, and the yet remaining hydrochloric acid precipitated with nitrate of silver, yielding $0.115 \text{ Ag Cl} = 13.48$ per cent. Cl. Then, since 0.2642 air dried substance, precipitated with silver salt, yielded $0.188 \text{ Ag Cl} = 17.59$ per cent. Cl; there would be in the above case a loss of 17.59 per cent., less 13.48 per cent., or equal to 4.11 per cent. of Cl, or 4.23 per cent. of H Cl. This gives for the water of crystallization $8.76 - 4.23 = 4.53$ per cent.

The composition of the compound therefore answers to the formula $\text{C}_{20} \text{H}_{24} \text{N}_2 \text{O}_2, 2 \text{H Cl} + \text{H}_2 \text{O}$.

		Required.	Found.	
			Zorn.	Hesse.
2 Cl	. .	17.11	. . 17.02	. . 17.59
H ₂ O	. .	4.34	. . —	. . 4.53

As a further characteristic of this substance, it may be mentioned that the alkaloid, precipitated by ammonia, contained no chlorine after it had been crystallized from dilute alcohol. According to Zorn, it contains chlorine; but that chemist had omitted to purify his alkaloid by recrystallization. This explains probably the difference in the results.

Zorn applies to the alkaloid he experimented with the name of quinidine; the author would not have ventured to substitute conchinine for that name had he not known that Zorn employed sulphate of conchinine in the experiment referred to. This salt is very seldom met with in commerce at the present time, owing to the fact that the barks used in quinine manufacture (except the Pitayo barks, which are becoming more and more scarce) contain an extremely small quantity, often mere traces, of conchinine, so

that the preparation of conchicine sulphate incidental to the manufacture of quinine sulphate has been almost entirely done away with. Notwithstanding this, a large quantity of "sulphate of quinidine" comes into the market; because it happens that in England, as well as in France and Germany, the barks now being used for manufacturing purposes are very rich in alkaloids which readily crystallize from ether, and from this portion of the alkaloid a sulphate is prepared, which, in conformity to its origin, is called "quinidine." But this "quinidine" consists in the main of cinchonidine, and only quite exceptionally contains conchicine. This must be mentioned, because it is still believed by many that the "sulphate of quinidine" of commerce is identical with sulphate of conchicine.

Remarks on Javanese Calisaya Bark and on Quinidine (Conchicine). Dr. de Vrij. (*Pharm. Journ.*, 3rd series, v., 482.) The author replies to several statements made by Dr. O. Hesse in his paper on the same subject. He admits that the plants originally introduced into Java do not belong to a *valuable* variety of *Cinchona Calisaya*, Weddell, but maintains, that they really do belong to that species and to no other, notwithstanding the large amount of quinidine (conchicine) contained in their bark. His authority for this assertion is Dr. Weddell himself, who had expressed himself to the same effect both to him and to Mr. Pahud, the colonial minister at the Hague; and as long as Dr. Weddell does not alter his opinion, Dr. de Vrij will hold that the cinchonas originally imported into Java under the name of *Calisaya* belong to the species described by Dr. Weddell as such.

Dr. de Vrij also differs from Dr. Hesse, when the latter states that in England, as in France and in Germany, a mixture of cinchona alkaloids freely crystallizing from ether serves to prepare large quantities of a so-called sulphate of quinidine, which however contains, according to Dr. Hesse, chiefly cinchonidine, and only by exception real quinine. Not being acquainted with the products of all the firms who manufacture cinchona alkaloids, he is unable to judge generally, if there be some truth in that assertion; but gratitude compels him to acknowledge, that as early as 1856, Mr. Howard presented him with pure quinidine, and that it is chiefly to the latter's generosity that he owes his peculiar knowledge of that alkaloid. The purity of this quinidine was proved both by optical experiments and by an examination of its compound with hydriodic acid. He also quotes an extract from Mr. Howard's letter, dated December 30th, 1856, in which that gentleman speaks in high

terms of the medicinal value of sulphate of quinidine, referring also to its low price, and to the desirability of its more extended application. To this the author adds, that when he went to Java in 1857, he took with him a large provision of sulphate of quinidine which he had received from Mr. Howard, and that during the six years of his stay in that country he always cured his servants of ague by this salt. In 1867, this sulphate was supplied by Messrs. Howard & Sons to the Indian government.

Further Remarks on Javanese Calisaya Bark. O. Hesse. (*Annal. der Chem.*, 176, 319.) In a previous communication (*Annal. der Chem.*, 174, 337) the author stated that the so-called Javanese Calisaya must be regarded as a species distinct from Weddell's *Cinchona Calisaya*, owing to the large amount of conchicine contained in its bark. In reply to this statement, Dr. de Vrij maintained that the plant in question is the true *Cinchona Calisaya*, though no doubt an inferior variety, that Weddell himself regarded it as such, and that its large percentage of conchicine could not be looked upon as a characteristic feature. In reference to the latter assumption, Dr. Hesse believes that Dr. de Vrij has relied on analytical results obtained by untrustworthy methods; and in support of this supposition, he quotes an experiment he made with a mixture of alkaloids containing quinine, cinchonidine, cinchonine, the amorphous bases, and 18.2 per cent. of conchicine. He determined the amount of conchicine in five grams of the mixture according to De Vrij's improved process (see *Pharm. Journ.*, 3rd series, ii., 642); but though he strictly adhered to the directions given, he failed to recover more than 0.4 per cent. of the conchicine, the remaining 99.6 per cent. passing into the ethereal solution; whereas it is stated in the process, that the ether used in the separation of the bases takes up mere traces of conchicine. No better results were obtained by De Vrij's older method.

The author admits the great external resemblance between the *Cinchona* in question and *Cinchona Calisaya*, but points out differences in the leaves and capsules which have also been observed by Junghuhn (*Uebersicht der Cinchonon*, p. 31). Weddell seems to have referred this Javanese Calisaya to *Cinchona Josephiana*; but this view appears untenable, as the former is a tree, whereas the latter is only known as a low shrub. Barks evidently emanating from trees, and closely agreeing as regards their alkaloids with the so-called Javanese Calisaya, are also stated to have been obtained from South America. That such barks are rarely met with in commerce may be attributed to their worthlessness for the manufacture of quinine,

Dr. Hesse therefore remains of opinion that the so-called *Cinchona Calisaya* which is cultivated in Java, must be considered as a distinct species.

Cinchona Hasskarliana of Java. Dr. de Vrij. (*Journ. de Pharm. et de Chim.*, 4th series, xx., 106.) This eminent quinologist objects to the name of *Cinchona Hasskarliana* given by the late M. Miguel to a species of cinchona mentioned by M. J. Jobst. (See *Year-Book of Pharmacy*, 1874, 19.)

His reason for differing from M. Miguel is, that he has seen this plant grow as a hybrid produced by the fecundation of the flowers of a weak *Calisaya*, by the pollen of vigorous *C. Pahudianas* growing quite near. After having himself collected the fruits from the *C. Calisaya*, M. de Vrij found that the young plants differed from the tree from which the seed had been obtained, and that these variations from the mother plant were not accidental, but proved to be constant. This is probably the reason why M. Miguel thought that this plant belonged to a new species.

At a meeting of the Linnean Society in London, on March 3, Mr. Howard read a communication from Mr. Broughton "On the Hybridism of the Species *Cinchona*," and in the discussion following the reading of this paper, Dr. Hooker stated that many plants which were thought by botanists to be species, were probably only hybrids, and cited the cases of hybrids of cinchona, observed by Mr. Broughton and by Dr. de Vrij in proof of his assertion.

This latter gentleman has requested his friend Mr. McIvor, at Ootacamund, to fecundate a *Calisaya* by the pollen of a *C. Pahudiana*; and until this experiment shall have proved his assertion to be incorrect, Dr. de Vrij will look upon the so-called *C. Hasskarliana* as a hybrid. He has given it the name of *C. Calisaya hybrida*.

Presumed Hybrid between *Cinchona Calisaya* and *Cinchona Sucirubra*. J. E. Howard, F.R.S. (*Pharm. Journ.*, 3rd series, v., 1.) In the *Pharmaceutical Journal* of July 12, 1873, and subsequently in a communication to the Linnean Society "On the Genus *Cinchona*" (*Linnean Soc. Journ.*, xiv.), the author gave an account of the produce obtained from seed sent to him by Mr. Broughton from two trees of the same red-under-leaved variety of *Calisaya*. In the latter treatise he discussed the question as to the probability of the various aspect of the plants having been the result of hybridization or otherwise. Since then he has obtained some fresh light on the subject, as will be seen from the following report.

Towards the end of May, 1874, when the plants were just two years old, five of them were cut down, leaving some inches of the

stem to sprout again; the bark of the remainder weighed when fully dried, 880 grains. On subjecting the bark to a chemical examination, the author found that he had to do with a substance partaking in something like equal proportions, of the qualities of red bark and Calisaya bark. He obtained a crystallization of mixed sulphates of quinine and cinchonidine, the latter of which exists in true Calisaya in very minute proportions, if at all. By cautious recrystallization, the sulphate of quinine was brought into a state of pure and white crystals, justifying the Calisaya character of the parent trees from which the seed was obtained. On the other hand, the residuary alkaloid was, as it usually is from the *C. succirubra*, very impure and uncrystallizable.

Certain peculiarities in the products led to a search for quinamine; and after precipitating the residuary alkaloids by potassic sulphocyanide (see Dr. de Vrij on Quinamine, *Pharm. Journ.*, 3rd series, iv., 609; *Year-Book of Pharm.*, 1874, 158), the precipitation and re-solution in pure ether, yielded a substance which had a close resemblance to Hesse's quinamine, crystallizing by spontaneous evaporation in long needles, forming a peculiar tracery on the sides of the glass vessel.

In the report of his researches on the bark of *Cinchona succirubra*, published in 1862 (about ten years previous to the discovery of quinamine), Mr. Howard mentioned as the characteristic peculiarity of red bark, that it ordinarily contains the alkaloids quinine, cinchonine, cinchonidine, quinicine (?), and aricine (?). He has no hesitation in stating that the recent examination of the bark of his five trees has given him again the same results; thus still more strongly indicating the effect of hybridism, than by the large amount of cinchonine present.

As nearly as could be ascertained, the bark of the five trees produced—

Sulphate of Quinine	0.170
Sulphate of Cinchonine	0.170
Cinchonidine	0.170
Quinamine (?)	0.100
Amorphous alkaloids	0.700

That the plants themselves partake of the same intermediate character, the author has been able more fully to show, since Mr. Broughton presented him with a collection of eighteen specimens of *Calisaya* from the plantation of Nediwuttum. Amongst these considerably diverging varieties is a pressed specimen of the No. V. sort from which those of Mr. Howard spring. Some of Mr.

Howard's resemble this parent; others have so much the character of *C. succirubra* as to be taken at first sight by Mr. Broughton for that variety; but whilst in form and general appearance they resemble the *C. succirubra*, they are distinguished by the peculiar gloss which marks the *Calisaya*, and which is entirely absent from the *C. succirubra*.

On the whole it may be safely concluded that there has been an interference in this case of the pollen of the *C. succirubra*, growing, as Mr. Broughton states, in the immediate neighbourhood. This view stands the more confirmed, since it accords with observations made by Dr. de Vrij on a hybrid sort in Java. This leads to curious reflections in connection with vegetable physiology. Through the mixture of the two essentiaë, brought about by pollen so nearly similar, a change must have been wrought in the chemistry of each cell of the inner bark, if it is in these that the alkaloids are elaborated. The author brings into relationship with this fact the following observations of the skilful chemist attached to the Dutch cinchona plantations. Mr. Moens gives him the following information (dated Dec. 5, 1873):—

"Some years ago, M. v. Gorkom had grafted two *Calisayas* upon two *Pahudianas*. The grafts succeeded very well, and I have recently taken the barks for examination. This showed that the *Calisayas* as well as the *Pahudianas* kept their alkaloids as if they had grown separately. The former contained no quinine or cinchonidine, but quinidine (Pasteur) and amorphous alkaloids. The latter gave quinine, much cinchonidine, no quinidine, cinchonine, and amorphous alkaloids. I think this is an experiment of considerable interest, and shall repeat it, if possible, with *C. micrantha* and *C. Calisaya* (Ledger). I think the result agrees with your idea, that the alkaloids are formed in the cellular tissue of the bark."

For the rest, it would seem that in *Cinchona* at least the effect of hybridism tends only to degeneration.

Some recent Importations of Cinchona Barks. D. Howard. (*Pharm. Journ.*, 3rd series, v., 1025.) The recent importations of cinchona bark from the East Indian plantations have afforded an opportunity of confirming an observation made by Dr. de Vrij (*Pharm. Journ.*, 3rd series, iv., 869) of the presence of quinidine in the renewed bark of *C. succirubra*.

Samples of renewed bark have been received from three different plantations in the Neilgherries, and they all prove to contain quinidine in quantities of 0·1 to 0·2 per cent. The bark of the same species from the same plantations, grown either exposed or

under moss, has in no case yielded this alkaloid when similarly tested.

It is most remarkable that the abnormal growth of the renewed bark should thus not only modify the proportions of the alkaloids found naturally in the bark, but develop another alkaloid that does not appear to exist naturally in this bark grown either in South America or in the East Indies; at any rate, in appreciable quantities.

Another curious example of the effect of the circumstances of growth in modifying the production of this alkaloid is afforded by the *C. officinalis* of the same plantations; a sample of the root bark of this species gave as much as 0·8 per cent., while the stem bark of the same trees yielded only 0·13 per cent.

It would have been very interesting to observe the effect of renewing the bark of the same trees from which this root bark was taken upon the production of quinidine; but unfortunately the experiment was not tried. A sample of renewed bark of *C. officinalis* from another plantation gave 0·2 per cent. of quinidine, the natural bark of the same plantation giving only 0·04; in this case the quinidine is increased, but not beyond the quantity found in some samples of natural crown bark.

It will be observed that both the renewed bark and the root bark show in their texture the signs of a somewhat analogous process of growth. It is to be hoped that the influence of cultivation and of the circumstances of growth upon the development of the different alkaloids will receive all the careful study it deserves; it is evident that there is still much to be learned about this matter, and that much of the future success of the East Indian plantations depends upon careful chemical research.

Cinchona Cultivation in the Mauritius. Dr. Small. (*Pharm. Journ.*, 3rd series, vi., 21.) A few years ago the culture of the cinchona plant on a small scale was begun at Curepipe, on ground belonging to the Civil Government, and immediately adjoining that where our sanitarium is situated. These plantations, since extended, have been fairly successful, and in time will doubtless prove of much importance to the colony.

Of the four species originally brought from Ceylon, *Cinchona Pahudiana*, *officinalis*, *Calisaya*, and *succirubra*, the last named thrives best in the Mauritius, the climate being too hot and the soil too heavy for the others. Mr. Horn, the director of the Government Botanical Gardens, informs the author that several of the plants were grown from seed received from Kew, Java, Ceylon, and India, but that he prefers to grow the young plants from either cuttings or

layers, the latter mode giving the best and strongest plants; raised from seed, the plants remain very delicate for long periods, requiring no end of nursing.

Analysis.

1. This sample consisted of small pieces of bark, varying in thickness from 1 to 4 millimetres, and presenting in the inside part a reddish orange tint, and on the outside a brown colour. The thinnest pieces of bark stripped from young branches were formed of the cellular envelope alone, the thicker pieces presented a notable proportion of liber. The skin was completely free from any parasitic vegetation.

2. Examined under the microscope, the pieces in question presented cells containing small greyish crystals soluble in acids (quinates and quinovates of quinine).

3. According to the instructions received, the analysis was conducted so as to ascertain,—

(1) The yield of the samples taken as a whole.

(2) The comparative yield of the younger bark containing only the cellular envelope, and of the older ones containing liber.

4. Moreover, the author considered that it might be interesting to ascertain as regards *Cinchona succirubra*, the opposite opinions advanced by scientific men with respect to the particular parts of the various layers of the bark, where the different alkaloids are to be found. Weddell and Karsten considered that quinine resided principally in the cellular tissue, interposed between the fibres of the liber, and cinchonine in the cellular envelope; while Howard inferred, from his examination of the bark of *Cinchona latifolia*, that, on the contrary, quinine was predominant in the cellular envelope and cinchonine in the liber.

5. In consequence, the several pieces of bark were carefully sorted, those containing liber being put on one side, and those having only the cellular envelope on the other. The whole lot was thus divided into two parts, as follows,—

(1) Bark containing liber, 104 grams.

(2) Bark without liber, 168 grams.

Two thirds of each sample were separately reduced to powder, and 10.40 grams of the first was mixed with 16.80 grams of the second, in order to have an average of the whole. The remaining pieces of bark of the first sample were scraped on their inside with a knife, in order to separate the liber and to analyze it apart from the cellular envelope.

6. The several analyses were made upon quantities of 12 grams each, by the ordinary process by sulphuric acid and lime; and these analyses were subsequently verified by further analyses made by Woehler's process by chlorohydric acid and ammonia.

7. This latter process having proved more exact by giving a smaller loss than the former, only the proportions obtained by it are recorded.

TABULAR STATEMENT OF ANALYSIS (ON 1000 PARTS).

No. 1. *The average Sample.*

	Alkaloids.	Corresponding to Crystallized Sulphates.
Quinine . . .	12.40	16.52
Quinidine . . .	7.74	10.28
Cinchonine . . .	8.52	10.60
	<hr/> 28.66	<hr/> 37.40

No. 2. *The older Bark.*

	Alkaloids.	Corresponding to Crystallized Sulphates.
Quinine . . .	13.80	17.60
Quinidine . . .	8.16	10.90
Cinchonine . . .	10.28	12.82
	<hr/> 32.24	<hr/> 41.32

No. 3. *The younger Bark.*

	Alkaloids.	Corresponding to Crystallized Sulphates.
Quinine . . .	11.50	15.36
Quinidine . . .	6.39	8.50
Cinchonine . . .	7.35	9.10
	<hr/> 25.24	<hr/> 32.96

No. 4. *The older Bark separated from its Liber.*

	Alkaloids.	Corresponding to Crystallized Sulphates.
Quinine . . .	15.05	20.10
Quinidine . . .	9.07	12.05
Cinchonine . . .	9.16	11.46
	<hr/> 33.28	<hr/> 43.61

No. 5. *The Liber.*

	Alkaloids.	Corresponding to Crystallized Sulphates.
Quinine . . .	11.30	15.08
Quinidine . . .	9.07	12.00
Cinchonine . . .	12.52	15.70
	<hr/> 32.89	<hr/> 42.78

8. It would appear from these analyses that in a cinchona bark containing, as does *Cinchona succirubra*, the three alkaloids in nearly equal proportions, quinine is comparatively more abundant in the young than in the old bark.

9. As regards the seat of the several alkaloids in the bark, the figures above mentioned would rather support the opinion of Howard against that of Weddell and Karsten.

As a general rule the proportion of 32·24 per 1000 of alkaloids in the old bark is a pretty satisfactory yield, when compared with first-rate commercial red bark, which, according to Frémy and Pelouze, yields 41·60 per 1000 of alkaloids.

In an analysis of the bark of cinchona roots made by Messrs. de Vrij and Howard, that of the young roots was found to contain the enormous proportion of 120 per 1000 of alkaloids. The last hurricane having caused considerable damage to the cinchona trees at Curepipe, and these plantations being exposed to periodical renewal of such losses, it may be perhaps practicable, as proposed by Dr. de Vrij, to establish a system of cultivation by which the young plants might be cut down and uprooted when three or four years old, in order to have the bark from the root.

Jaborandi as a Diaphoretic and Sialogogue. (From the *Medical Times and Gazette*.) M. Albert Robin has communicated to the Therapeutical Society (*Gazette Hebdomadaire*, November 20) an account of his investigations on the effects of this drug, in which he has been engaged in Professor Gubler's ward at the Beaujon. Under its influence the urea is at first diminished in quantity in consequence of the amount of the urine being diminished; but after some days both these are increased, and the same may be said of the chlorides and the uric acid. This last has not been found either in the sweat or saliva, but the urea has been met with in the proportion of 3·12 grams per litre. In a case of albuminuria the amount of albumen diminished during the first twenty-four hours from 17·20 grams to 15·40; but the diminution was not permanent except in one case, in which it continued reduced from 14·40 to 12 grams. The temperature increases in ten or twenty minutes, rising from 37° to 39° or 39·8°; the pulse also increases (from 96 to 105, for example). During the sweating the temperature falls to 37·7°, 37·6°, or 37·2°, and, when this is terminated, to the original 37°. For the next two days after the administration both pulse and temperature remain lower than the normal rates. When the sweating commences, "a true experimental asystolie" is produced, the tension diminishing notably; but next day the tension is reproduced, and becomes some-

times more considerable than in the normal state. The *jaborandi* therefore seems to act on the vasomotors, diminishing tension by paralysing them, and facilitating the passage of the blood through the capillaries of the skin. In several cases in which it was given in minutely divided doses, there was neither sweating nor salivation, an abundant diuresis taking place, so that the urine increased from 750 to 1380 grams. The effect of *jaborandi* on animals is very marked: guinea pigs are seized with salivation, weeping, and diarrhoea, true ecchymoses being found in the intestines, and dogs become instantly salivated, their gastric secretion being also much increased.

M. Gubler observed that he had recommended M. Robin to employ the divided doses, in consequence of his having observed that diuresis occurred the next day or day but one after taking a large dose.

He supposed that if the portion of the *jaborandi* which remained in the system after three days proved diuretic, this effect might be at once produced by giving small divided doses. A small quantity thus does not suffice for influencing vascular tension, acting only on the kidney. M. Gubler believes that the sweating determined by this drug depends upon the diminution of the tension which it causes, but that a complete equation cannot be established between this diminution of tension and the sweat. Another factor is the secretory irritation of the glands, an irritation acting on the kidney and inducing diuresis.

Jaborandi. W. Martindale, F.C.S. (*Pharm. Journ.*, 3rd series v., 364 and 561.) Having received two small consignments of this drug from Paris, the author witnessed a trial of it by Dr. Ringer on two boys, at University College Hospital, in the presence of Professor O'Leary, of Cork.

Half a dram, infused in a little boiling water for ten minutes was given to each, the whole was swallowed without straining. As stated by Dr. Coutinho, in ten minutes the perspiration became visible on the face of one of the boys, and the whole body soon became enveloped in it; this continued for more than an hour. The sialogogue effect in this case was not so marked, although the secretion of saliva was above normal. In the other case the salivation was most marked, but the diaphoretic action not perceptible, the boy's face became covered with a suffused flush, the secretion of saliva was very profuse, he had a disinclination to speak, and appeared much depressed. The temperature in both cases fell quite one degree, although at first it was raised a little; and the pulsation

also was quickened while the action of the medicine lasted. Notes were taken of these, but they are not in our province. Dr. Ringer will ere long publish more on this head.

As several kinds of jaborandi are said to be known in Brazil, the author satisfied himself that his sample was of the same kind as that with which Dr. Coutinho and Professor Gubler experimented at the Beaujon Hospital. The lamina, which is about the thickness of Alexandrian senna, is much reticulated; the veinlets are raised, and show very distinctly on both sides of the leaf; the margin is entire, and a little recurved, probably the effect of drying. Judging from a piece picked out, measuring three quarters of an inch across, and which was a complete half section of a portion of the leaf from the midrib to the margin, the entire leaf or leaflet seems to be about two inches broad by about four inches long; but this, of course, is doubtful. The lamina contains a number of glands, which are arranged very regularly about half a line apart. These give a peculiar pellucid dotted appearance to the leaf when looked through towards the light, similar to that in buchu and other rutaceous and hypericaceous leaves. The odour is very characteristic, resembling that of a mixture of Indian hemp, matico, and cubeb. So much is the odour of the last two present, as to lead one to suppose that it must be nearly allied to them, yet it has little pungency in taste. According to Professor Gubler, Professor Baillon, by comparing Dr. Coutinho's samples of jaborandi with the Brazilian plants in his herbarium, has been able to assure himself of the identity of jaborandi with a species of the Nat. Ord. Rutaceæ, the *Pilocarpus pinnatifolius*, Sem. This the writer thinks is an error, although the description of the whole leaf given by Professor Gubler exactly agrees with that of some fresh leaves of *Pilocarpus pinnatifolius* obtained by Mr. Holmes from Kew Gardens. The margin of the leaflets of the latter becomes a little recurved on drying, but the veinlets appear much more raised on the under surface of the leaf than on the upper. The dotted glands are about the same size, perhaps a little more numerous than those on the jaborandi. But the odour and taste of the leaf of *Pilocarpus pinnatifolius*, when dried and bruised, is very distinct from that of jaborandi; its odour resembles that of the ivy leaf bruised, and the infusion in boiling water smells somewhat like that of boiled spinach. The taste is peculiar, rather pungent, and produces a tingling sensation upon the tongue. The administration to a boy, twelve years of age, of half a dram of it infused in boiling water, in about twenty minutes produced merely a little flushing in the face; the diaphoretic and sialogogue actions were entirely absent.

Of course these leaves were from a plant of hot-house growth; grown in its natural habitat its effects might be different, but still, Dr. Ringer and others, as well as the author, who watched the cases, and examined the leaves and infusions of both, were satisfied this was not the same as the jaborandi they had tried before.

As already mentioned, the somewhat aromatic odour of jaborandi would lead one to suppose that it was the produce of one of the Piperaceæ, but botanists think differently. Professor Oliver, at Kew (as well as Professor Baillon), thought it was a rutaceous leaf. Yet there is a species of pepper undoubtedly called jaborandi, the *Piper Jaborandi*, Velloso, the reticulations of which, by reference to specimens in the British Museum herbarium, are much like those of the specimen obtained from Paris; but the dots are arranged mostly in parallel rows on each side of the smaller veins, and are more numerous and smaller than on the other, the leaf also is more papyraceous, and appears to be larger, than the leaf or leaflet of jaborandi. Its leaf also is simple, not pinnate, as the whole leaf of jaborandi has been described by Professor Gubler. By comparison with the leaves of other species of *Piper* at the British Museum and Kew, by the kind permission of Mr. Carruthers and Professor Oliver, Mr. Martindale was not able to make out any that resembled his sample. If it be a pinnate leaf, it was, perhaps, a waste of time to look in that natural order for it.

The *Mouniera trifolia*, Aublet, N. O. Rutaceæ, goes by the name of jaborandi in some parts of Brazil (*L'Union Pharmaceutique*, 1874, 186), but the leaflets of this are small, not larger than that of the common privet, which it somewhat resembles. Among the rutaceous plants which Mr. Holmes and the author examined at Kew, *Ticorea jasminiflora* and *Galipea heterophylla* most resembled the sections of leaf the latter picked out of the jaborandi. Until a further supply is obtained, including the organs of reproduction, it is impossible to say what the name of the plant is that yields the drug noticed in this article.

A further supply of jaborandi having arrived a short time after the publication of the previous article, Mr. Martindale tried the effects of the drug upon himself. He gives the following account of the results:—

“To me the effect seemed simply marvellous. I made an infusion of 60 grains of the bruised leaf in five ounces of boiling water, allowed it to stand for 15 minutes, and strained it. On pouring the water upon the drug I noticed the characteristic odour had almost entirely disappeared. The infusion was of a pale sherry colour, had a mawkish

bitter taste, but did not excite the glowing heat upon the tongue that the leaf itself did. This I thought strange, and on tasting the dregs I found they still retained their pungent taste when chewed. It was evident to me that if its diaphoretic properties depended on the principle having this pungent taste, boiling water does not extract it. At 11.30 p.m., on retiring to rest, I swallowed as much of the dregs as I could, probably 50 out of the 60 grains used, and washed them down with the infusion. In five minutes I felt a glow, an increased circulation, an uneasiness in the head, became restless, and the secretion of saliva began to increase. At 11.45, a quarter of an hour after taking the dose, I was perspiring freely. The salivation and perspiration continued to be profuse until my sight became blurred. At a distance of four feet I could see my wife, but could not distinguish her eyes. On this occurring I became a little anxious, as I had evidently taken an overdose. I requested that Dr. Ringer might be sent for; he came about 12.15 a.m. The impaired vision still continued, but I was glad to find that it was only at a distance—near objects I could see distinctly enough. The pupils of the eyes were slightly dilated, I was informed. The pulse when first noted was 96, and got up to 104. The temperature was not taken. The depression was never very great, but a little before Dr. Ringer came I began to shiver, more clothes were put on the bed, and some spirit and water given to me. The excessive perspiration still continued from all parts of the body. A Turkish bath, which I have frequently had, and seen others have, was nothing to it; the saliva for a time required almost constant ejection; the secretion of this from the glands in the cheeks caused a kind of collapsed feeling in them. My speech was so affected that articulation was both difficult and indistinct. Eventually, about 1 a.m., I was sick, and vomited at first a quantity of saliva which I had swallowed. Putting my finger in my mouth vomiting was further excited, until a portion of the jaborandi returned. The effects were now subsiding: more spirit and water were given to me; my night-shirt, soaked with perspiration, was changed. I was put into a warm blanket, and about 1.40 a.m. I fell asleep, and slept a quiet sleep till 6 a.m. The pulse on awakening was 88; normally with me it is 80. I got up about 7.30 a.m., and although I felt squeamish all next day I was able to attend to business as usual. When the action was at its height, on uncovering my arm, I am informed the perspiration passed off in steam from my hand and night-shirt sleeve. The saliva collected, which was distinctly alkaline, measured 16 ounces, in addition to which a quantity had flowed on to the pillow while I slept, as it was quite

wet in the morning. I came to the conclusion that I should not like to pass through the ordeal again. My thanks are due to Dr. Ringer, whose presence and kindness greatly relieved my anxiety."

In M. Robin's account of the result of his researches in Professor Gubler's wards in Paris, no mention is made of the peculiar action of jaborandi upon the vision, which, it appears, has not been previously observed.*

The strained infusion is stated to produce but little effect.

The Botanical Source of Jaborandi. E. M. Holmes. (*Pharm. Journ.*, 3rd series, v., 581.) Having lately had the opportunity of examining a quantity of jaborandi from Pernambuco, through the kindness of Messrs. Hearon, Squire & Francis, the author was fortunate enough to find several ripe fruits of the plant. These fruits were distinctly rutaceous in their character, and enabled him to confirm Professor Baillon's conjecture that they belong to that natural order, and probably to a species of *Pilocarpus*, which, if not identical, certainly comes very near to the *P. pennatifolius*, Lémaire.

The specimens of the plant examined appear to belong to a shrub about five feet high. The root is cylindrical, hardly tapering at all, nearly three quarters of an inch in diameter for the first twelve inches, and very sparingly branched. The bark of the root is of a pale yellowish brown colour, about one line in thickness, and has a very short fracture. The outermost layers are very thin and papery, and are frequently exfoliated. A small portion of this layer placed under a microscope forms an extremely pretty object, and is seen to consist entirely of strongly reticulated dodecahedral cells. The odour of the root is like that of a mixture of bruised peapods and orange peel. The taste is at first like that of green peas, but this soon disappears, and gives place to a tingling sensation, which is much more powerful than that produced by the leaves or bark of the stem, and endures for a considerable time. By gaslight the transversely-cut surface of the bark is seen to sparkle with minute crystals.

The stem is half an inch in diameter near the root, narrowing to a quarter of an inch in the upper branches. The bark is thin, of a greyish brown colour, longitudinally striated, and sprinkled over in some specimens with a number of white dots, which are not lenticels, but the remains of old oil receptacles. The bark of the stem is thin and fragile, and readily scales off when the stem is broken or bent; it has a short fracture, and is yellowish white internally; its inner surface sparkles with minute crystals; it has not, to any appreciable

extent, the peculiar leguminous taste of the root. The wood of the stem is yellowish white and remarkably fibrous. The stem is alternately branched at a very acute angle (about 20°), the branches being erect and furnished with alternate leaves. The leaves, one of which is represented on p. 172 (fig. 1), are imparipinnate, about nine inches long, with from three to five pairs of opposite leaflets, which are articulated to the rachis, and have very short slightly swollen petiolules; those of the upper leaflets are about one line long; those of the lowest leaflets about three lines long; and the terminal one has a petiolule from half to one inch long. The rachis of the leaf is swollen at the base. The pairs of leaflets are usually about $1\frac{1}{4}$ inch apart, the lowest pair being about four inches from the base of the rachis.

The leaflets are very variable in size, even on the same leaf. Their general outline is oblong-lanceolate. They are entire (fig. 2), with an emarginate or even retuse apex, and an unequal base. Their texture is coriaceous, and when moistened they resemble in size and thickness the leaf of the cherry laurel. The veins are prominent on both sides of the leaf, and branch from the midrib at an obtuse angle (about 60°) in a pinnate manner, remaining distinct until within one quarter of an inch of the margin of the leaf, where they become lost in the network of veinlets. The midrib is scarcely prominent on the upper, but forms a distinct keel on the under surface of the leaflet. When held up to the light the leaflets are seen to be densely pellucidly punctate. These pellucid dots, which are receptacles of secretion, are not arranged, as in another kind of jaborandi, in lines along the veinlets, but are irregularly scattered all over the leaf, and appear equally numerous in every part; they are mostly rather large, but vary a little in size. The whole plant is glabrous.

It may be remarked here that there appear to be two varieties, if not species, of this *Pilocarpus*, the one being perfectly smooth in every part, as above described, and the other having the stems, petioles, and under surface of the leaves covered with a dense velvety pubescence composed of simple hairs. The hairs are not so numerous on the leaves and lower part of the stems, but appear to be singularly persistent, as they may be found on the bark for a considerable distance down the stem when it is examined with a lens. In shape and size the leaves resemble those above described, but are rather thinner in texture, and have a somewhat different and less pungent taste. The lowest pair of leaflets in the specimens the author has examined are only two to three inches from the base of the rachis. The author has not succeeded in finding entirely glabrous

leaves on the stems which have hairy leaves, nor hairy leaves on the stems which have smooth leaves, and therefore considers that the plant with hairy leaves is probably a distinct variety.

The inflorescence is a raceme, six or eight inches long, judging from the peduncle figured on the next page. The base of the peduncle there represented is entire, but the top is evidently broken off, so that it may have been one or two inches longer. The pedicels, so far as can be learned from the scars on the peduncle, are numerous, and about three eighths of an inch apart. Whether they are horizontal or not when flowering it is impossible to say. The only two specimens the author has seen are in fruit, and have the pedicel deflexed and about half an inch long. The fruit, fig. 3, closely resembles in external appearance that of a specimen of a Cuban plant in the British Museum,* referred by Asa Gray to *Pilocarpus heterophyllus* (Pl. Wrightianæ, p. 170; Wright, 1129). When perfect it consists of five carpels, of which not more than two or three are usually developed to maturity. When ripe the carpels dehisce into two valves, as in fig. 5, and then remind one strongly of miniature cockleshells, fig. 4, with the valves open, exposing the animals.

This appearance is owing to the fact that, as in two or three other closely allied genera, the endocarp separates at a very early stage, and thus forms an inner case for the seed, as represented in figs. 5 and 7. The outer portion of the carpel, consisting of the united epicarp and mesocarp, is in most of the specimens of a pale brown or buff colour, coriaceous, convex on both sides, of a somewhat circular form, but with the inner edge (*i.e.*, that nearest to the stigma) nearly straight, marked both inside (fig. 6) and outside (fig. 4) with curved ridges, which anastomose towards the outer edge, and are almost absent from the inner edge. The convex surfaces only are dotted with oil receptacles. The endocarp (fig. 10) is smooth and pale yellow, with a wide sinus in the inner edge, which is occupied by a membranous expansion (fig. 7) of the shape shown in fig. 8. To the upper portion of this expansion, which appears to be a dilatation of the placenta, the seed (fig. 9) is suspended by a narrow, lancet-shaped, extremely short funiculus; this is shown in fig. 5. The seed, of which there is only one in each carpel, is black and shining, somewhat reniform, convex on both sides, enlarging towards its base, and forming a sharp ridge at the back towards the apex.

* The genus *Galipea*, to which *P. heterophyllus* has been referred, is distinguished from *Pilocarpus* by the convolute cotyledons, tubular flowers, and anthers not versatile.



1. An entire leaf. 2. Leaflet: under side, showing the venation. 3. An entire fruit and peduncle—nat. size. 4. Ditto, with two carpels only developed, showing the deflexed pedicel. 5. Carpel, showing the dehiscence. 6. A carpellary valve with the endocarp removed, showing the reticulated inner surface. 7. Endocarp, showing the dilated placenta and short funiculus. 8. Placenta separated. 9. Seed: *a*, hilum. 10. Endocarp without placenta. 11. Cotyledon.

The hilum is lancet-shaped, the vessels appearing to pass through its lower end (fig. 9 *a*). The testa is thick and coriaceous, the endopleura membranous. The seed is inverted, somewhat reniform in outline, with a superior radicle, plano-convex cotyledons, and is exalbuminous, the radicle being very minute (fig. 11).

The genus *Pilocarpus*, to which this plant has been referred by Professor Baillon, was limited, as originally defined by Vahl to plants with simple leaves, and seeds having biauriculate cotyledons. As further extended by Bertham and Hooker in their "Genera Plantarum," p. 299, the plants of the genus *Pilocarpus* are said to have "simple, ternate, or pinnate leaves," while no mention is made of the cotyledons being biauriculate. The seeds, however, are stated to be ovate, with a membranaceous testa, and exalbuminous.

The jaborandi plant differs from the description of the genus, as defined in the "Genera Plantarum," only in the following particulars:—the seeds are somewhat reniform, not ovate, and the testa is coriaceous, not membranaceous. The cotyledons are not auriculate, but as that character is not given as an important one, it alone is not sufficient to exclude the plant from the genus. Since there are several genera closely allied to *Pilocarpus* in the tribe (*Zanthoxyleæ*) to which jaborandi evidently belongs, it will not be possible, until the flowers of the jaborandi plant have been examined, to decide with certainty whether it belongs to the genus *Pilocarpus* or not, for the above-mentioned differences can scarcely be considered sufficient to separate it.

Whether it be identical with the *Pilocarpus pennatifolius* of Lémaire is more doubtful for the following reasons:—

The fruit of Lémaire's plant has not, the author thinks, been described.

The plant of *P. pennatifolius* at Kew, which is without doubt Lémaire's plant, has a much longer and stouter raceme (2-3 times the diameter and nearly twice as long) than that of the jaborandi, and has quite a succulent appearance.

The leaves of Lémaire's plant are of much thinner texture than those of the jaborandi, and the veins on the upper surface are much

less prominent; the leaves also taper below much more rapidly than in the jaborandi.

The geographical distribution is different. Lémaire's plant, so far as it is known, is extratropical, while the Pernambuco plant comes from near the equator.

Hairs do not appear to be present even on the youngest leaves of the smooth variety of jaborandi, but are stated by Lémaire to be present in the young parts of his plant.

It appears, probable, therefore, that the jaborandi of Pernambuco is a species of *Pilocarpus*, which, judging from the materials at present examined, comes very near to the species suggested by Professor Baillon, although probably distinct from it.

The hairy variety of jaborandi seems to come much nearer in the texture of its leaves to *P. pennatifolius*, Lémaire, but from the persistence of the hairs, even upon the grey bark, the author is inclined to think it also a distinct plant.

Whether these conjectures are correct or not can, however, only be decided by the arrival of flowering specimens of the plant, which the author hopes, through the kindness of Mr. W. Squire, to have the opportunity of examining during the present year.

As there are several plants used in South America under the name of jaborandi, which seem to possess somewhat similar properties in varying degrees, it will be well in future experiments to distinguish the jaborandi here described and figured as Pernambuco jaborandi. Another species, which is in use both in France and this country, is a kind of *Piper*. It is readily distinguished from the Pernambuco jaborandi by the thin texture of the leaf, which is acuminate, and has pellucid dots so minute as not to be visible to the naked eye when the leaf is held up to the light.

Further Note on the Botanical Source of Jaborandi. E. M. Holmes. (*Pharm. Journ.*, 3rd series, v., 641.) In the 65th fasciculus of Martius' great work, the "Flora Brasiliensis," containing the *Rutacæ*, by Engler,—only recently published, three new species of *Pilocarpus* with pinnate leaves are mentioned, viz.:—*P. Selloanus*, Engl., *P. grandiflorus*, Engl., and *P. macrocarpus*, Engl. Of these the description of *P. Selloanus* answers to the smooth variety of jaborandi of Pernambuco much more nearly than that of *P. pennatifolius*, Lem.

From the following analysis of the pinnate-leaved species, copied from the above work, it will be noticed that the author separates the species with smooth leaves from those with hairy leaves; hence, if this arrangement be accepted, the hairy variety of the Pernambuco jaborandi must belong to a distinct species:—

B.—Leaves imparipinnate, 2-6 jugate.

a. Leaves smooth on both sides.

P. Selloanus, Engl. ; leaves 2-3 jugate.

Pedicels slender, six times longer than the buds ; ovary smooth.

P. grandiflorus, Engl. ; leaves 6 jugate.

Pedicels thick, scarcely longer than the buds ; ovary densely ferruginous-pilose.

b. Leaves shortly pilose beneath, especially on the nerves.

P. pennatifolius, Lem. ; leaves 1-3 jugate.

Leaflets linear ; oblong midrib ; and lateral veins prominent beneath.

P. Goudotianus, Tulasne ; leaves 1 jugate and unifoliate.

Leaves large, obovate or lanceolate-oblong, midrib only rather prominent beneath.

P. macrocarpus, Engl. ; not sufficiently known.

The following is a translation of the diagnosis of *P. Selloanus* :—

“*Stem* covered with thin purple bark, leafy towards the apex. *Leaves* imparipinnate. *Petiole* of leaf semiterete, flattened a little above, quite glabrous. *Leaflets* trijugate, oblong, distinct, nearly equal, obtuse, margin reflexed, membranaceous or subcoriaceous, greyish green, quite glabrous on both sides, pellucid punctate ; midrib sulcate above, very prominent beneath ; lateral nerves rather prominent beneath ; petiole of leaflet short. *Raceme* terminal, nearly three times longer than the leaves, terete, purple, quite glabrous, with slender pedicels horizontally patent and slightly hairy, six times longer than the buds, and furnished at the middle and base with two minute ciliolate bracts. *Calyx* very short, with broad rounded lobes, which are ciliolate. *Petals* coriaceous, lanceolate, acute, furnished with a prominent midrib, inflexed at the upper margin and at the apicules. *Stamens* shorter than the petals. *Ovary* depressed, globose, very smooth, half included in the disk, and crowned with a short, rather thick style.”

The figure represents the leaves as being slightly emarginate. In the greyish green leaves, slender peduncle and pedicels, and smooth fruit, *P. Selloanus* agrees with the jaborandi plant ; but the pedicels of *P. Selloanus* are longer and hairy ; this, however, future specimens of jaborandi may perhaps prove to be of no importance.

P. pennatifolius, Lem., is described as having bright green leaves, hairy on the veins beneath, and a thick peduncle with short thick pedicels. So far, therefore, as the most recent researches on this genus have made known the species, jaborandi must be said to approximate more nearly to *P. Selloanus* than to *P. pennatifolius*, Lem.

A Second Kind of Jaborandi. E. M. Holmes. (*Pharm. Journ.*, 3rd series, v., 781.) In a recent number of the *Revista Farmacéutica*,

published by the Pharmaceutical Society of the Argentine Republic, Señor Domingo Parodi, gives an account of a chemical investigation by himself of the active principles of jaborandi. Although the drug described by him is not, as he appears to think, identical with the jaborandi of Pernambuco, yet his method of procedure in examining the drug, and the results he obtained, may be not without interest.

The jaborandi which he has examined is that used by the natives of Paraguay, and is evidently, judging from the botanical description given by him, a species of *Piper*, but it does not, as he suggests, correspond to the *Piper Jaborandi* of Velloso. The plant described by Velloso has four stamens and four stigmas, that described by Parodi has two stamens and three stigmas. According to the author, "jaborandi" is a sort of generic name applied to various plants having an acrid or pungent taste, but restricted in Paraguay, in a medicinal point of view, to the *Piper* which he describes. That there may be no misunderstanding as to the plant which Parodi examined, his description is here quoted *verbatim et literatim* :—

"*Jaborandi*.—Suffruticosum, tri-ulnare ramosum, glaberrimum. Caule tereti nodoso immaculato. Foliis modice petiolatis, usque 9-pollicaria, subcoriaceis s. potius membranaceis, ovatis, opacis; supero oblongo-ovatis, apice breviter attenuatis, basi rotundatis parum inequaliter productis.

"Petiolis super sulcum læviter canaliculatis, non marginatis. Spicæ oppositifoliæ, erectæ, mediocres, breviter pedunculatæ, pedunculis subtilissime pubescens, hermaphroditæ. Bractæ floræ clavate, pressione angulatæ, apice convexæ, margine dense pubescentes.

"Filamenta elongata, crassa, marcescens. Antheræ 2, monothecæ, laterales, apice conniventes, basi divaricatæ, flavæ, siccæ fuscæ, rima laterale. Stylus brevissimus, persistens. Stigmata 3, raro 2, brevia, crassiuscula, divaricata. Baccæ feræ exsuccæ, confertissime, obovato-trigone, albumine farinosa. In sylva, loco humido propè Caacupé."

The properties of the Paraguay jaborandi resemble those of Pernambuco jaborandi, being powerfully sialogogue and sudorific.

The former is used for bites of poisonous reptiles, the expressed juice being applied to the wound, and a cup of an infusion prepared with the fruiting spikes, leaves, or roots, taken every quarter of an hour until copious perspiration ensues.

It is also commonly used for marsh fevers, and generally with a favourable result. Externally it is applied in the form of powder, plaster, or decoction, as a stimulant and detergent.

Being desirous of ascertaining if these properties were due to the

essential oil alone, Parodi made the following examination of the drug:—

Two kilograms of the leaves and spikes, with flowers and young fruits, were macerated for twelve hours in six times their weight of water, and then submitted to distillation.

The first kilogram of water that came over possessed a pungent and acrid taste, and had an opalescent appearance, with some drops of oily liquid floating upon the surface. Being saturated with chloride of calcium, the greater proportion of the essential oil separated; its taste was acrid and caustic. A current of hydrochloric acid gas was then passed through the oil, and this produced a crystalline mass similar to artificial camphor. The contents of the retort were then expressed, and the resulting liquid filtered and carefully evaporated to dryness. The extract thus obtained was macerated for two hours with alcohol of 40°, which separated the gummy part. The alcoholic solution was then evaporated, and the residue dissolved in water acidulated with hydrochloric acid, and afterwards treated with pure benzine. The mixture was shaken, the benzine solution separated, and then allowed to evaporate in the open air. In this way two grams of an amorphous residue were obtained, which, when redissolved in absolute alcohol, left a little resin, and the alcohol being left to spontaneous evaporation, there appeared in it small groups of interlaced prismatic crystals belonging to the rhombic system. These crystals heated in a tube with soda lime gave off an abundance of ammoniacal vapours. The crystals were easily soluble in amylic alcohol and benzine, but little soluble in dilute acids and in ether. The alcoholic solution is precipitated by phosphomolybdate of soda and by phosphotungstate of soda. This alkaloid has but weak affinities for acids. Sulphuric acid colours it a tawny yellow, passing slowly to green. It is fusible at 110°, and decomposed at a much higher temperature. The crystals treated with nitric acid give off nitrous vapours, and leave a residue of resinous appearance and extremely bitter taste. Gr. 0.50 submitted to analysis gave:—

Carbon	57.80
Hydrogen	5.86
Nitrogen	13.57
Oxygen	23.27
	<hr/>
	100.00

One hundred parts combine with 17.5 of hydrochloric acid, giving an equivalent which leads to the formula $C_{20}H_{12}N_2O_6$. The

characters of this substance seem to allow of its being placed, under the name of jaborandine, in the series of crystalline principles obtained from *Piperaceæ*: viz., piperine, methysticine, and kawaine.

Mr. Holmes thinks that the name "jaborandine" having been thus appropriated, it will be necessary, should any crystalline principle be obtained from *Pernambuco jaborandi*, to choose some other name for it, such as "pilocarpine."

Jaborandi. M. Planchon. (Abstract of a paper read at a meeting of the Paris Société de Pharmacie, March 3; *Pharm. Journ.*, 3rd series, v., 838.) The author is of opinion that there can be no doubt the plant belongs to the genus *Pilocarpus*, of which it presents all the characters; the disposition of the flowers and their structure being exactly those of plants of that genus. The fruit resembles in all points those in the museum belonging to the genus *Pilocarpus*, and particularly *P. heterophyllus*, A. Gray; the fruit of *P. pennatifolius*, Linn., is unknown. Referring to the question whether the occurrence of glabrous and very pubescent leaves indicates that they are derived from plants of two different species, he remarks that if they occurred alone it might have been supposed that they were, and the opinion would have received support from the positions occupied by the inflorescence, it being sometimes terminal, and sometimes occurring upon branches which had already lost their leaves. But after examining some specimens bearing several branches upon the same stem, he thinks he is justified in saying that leaves exist in all the gradations between the glabrous and pubescent forms. Moreover, Lémaire's diagnosis of *Pilocarpus pennatifolius* indicates that the plant, though at first pubescent, becomes glabrous proportionally as it increases in age: "frutex prima juventate totus puberulus, deinde glabratus." The difference in the position of the inflorescence does not appear to be accompanied by a corresponding difference in the organs of vegetation, and is not sufficient to divide the plants into two true species. Assuming, then, that the specimens examined were the products of a single species, M. Planchon considers that, notwithstanding they are yet imperfect, they confirm the original conjecture of Baillon that they are referable to *Pilocarpus pennatifolius*. The larger glabrous leaves correspond in all respects to those of that species in the herbarium of the museum. The flowers, however, differ in some respects, but the differences he considers are probably individual rather than specific. The terminal inflorescence hitherto discovered with the jaborandi is not sufficiently developed to compare with the adult inflorescence of the museum specimens,

whilst the latter do not include a plant having lateral inflorescence. Examined under the microscope, the roots were found to contain numerous large resiniferous cells in all the layers, except the thin exfoliating periderm. In the bark, below the suberose layer, is a circle of well characterized glands, analogous to the oleiferous glands of Citrus; whilst in the liber layer are sclerogenous cells, containing a drop of resinous matter, and more internally are resiniferous cells, resembling those of the root. The anatomical structure of the leaf is rather simple. An amorphous cuticle covering a single layer of square or rectangular cells represents the epiderm. Upon the upper side, immediately below this epiderm, is a series of long narrow cells extending perpendicularly to the surface, crowded together and containing chlorophyl. Lastly there is a loose parenchyma of cells also containing green granular matter. This parenchyma, frequently interspersed with air lacunæ, extends to the epidermic layer of the lower surface. Here and there fibro-vascular bundles occur, corresponding to the section of the nerves; and in the middle, at the point where the median nerve would be found, is a well developed bundle of ligneous tissue, intermixed with spiral vessels. In the middle of the parenchyma are large translucent oleiferous glands, formed of intercellular cavities, surrounded on all sides by special cells, which are smaller than those of the surrounding tissue, and which form a continuous wall to the gland. These cells are scattered here and there through all the section; sometimes they approach the upper surface, breaking in upon the layers of chlorophyl cells, but the greater number occur towards the lower surface. The stomata of the leaves, which are especially numerous on the under surface, are rather small, ellipsoid in form, and surrounded by two reniform cells; the hairs are simple and unicellular. The thick tawny-grey or brown petals of the flower are marked by numerous well-developed oil glands; and it was noticed that when moistened with warm water for the purpose of dissection, they gave off an odour which was much finer and more agreeable than that of the leaves, and resembling the smell of citron. In reply to a question, M. Planchon stated that from recent experiments the stem bark appeared to possess the same properties as the leaves.

Chemical Examination of Jaborandi. M. Byasson. (*Répertoire de Pharmacie*, March 25, 1875; *Pharm. Journ.*, 3rd series, v., 826.) The author has been engaged in an investigation having for its object to determine the nature of the active principle of jaborandi, a portion of which drug had been intrusted to him by Dr. Coutinho, for the purpose. He reports the isolation of a small quantity of

alkaloidal substance, which when injected into the veins of a dog caused an abundant flow of saliva.

The leaves under examination were first allowed to macerate in 90° alcohol, which treatment was continued during two months in consequence of the author's absence from home. The alcoholic liquor, which was of a green colour, was then separated from the leaves by filtration, and submitted to distillation. The addition of water to the distilled alcohol rendered it slightly turbid, indicating the presence of a little essential oil. A certain quantity of this oil was swallowed in suspension in the diluted alcohol without having any apparent effect. The taste was pungent and persistent. The residue from the distillation, allowed to stand, deposited a relatively considerable quantity of a green substance presenting all the characters of chlorophyl. After filtering, the liquid was of a reddish brown colour, had a slight aromatic odour, and after a time deposited a brown matter, which, taken up by alcohol and precipitated by water, presented all the characters of a resin; it was slightly acrid to the taste, and did not appear to have any medicinal action. A portion of the liquid was evaporated, and milk of lime added, when the reddish brown colour was immediately changed to a fine yellow.

Desiccation having been effected at a temperature not exceeding 60° C., the residue was exhausted with a great excess of chloroform. Distillation and evaporation of this liquid yielded a yellow-brown glutinous residue, presenting no trace of crystallization, and showing under the glass oleaginous particles. Treated with water acidulated with sulphuric acid, it partly dissolved, and formed a slightly brown acid and aromatic solution, which, when treated with ammonia in excess, threw down some glutinous flakes. Shaken with ether, and the ether evaporated, it yielded a viscous aromatic substance and some crystals of sulphate of ammonia.

This substance the author found to be soluble in absolute alcohol. It was precipitated by the general reagents for alkaloids, and particularly by the double iodide of mercury and potassium in acid solution. The yellowish white precipitate resembled in its characters the best defined alkaloids. The taste of this substance was acrid, with a bitter aftertaste, and a small quantity which was tasted by the author was sufficient to provoke the commencement of salivation but without sweating.

To another portion of the original liquid lime was added, and it was submitted to distillation. There was an abundant evolution of ammonia, and, to judge by the characteristic odour, of methylamine or an analogous base. The distilled liquor, agitated with ether,

yielded a small quantity of oleaginous viscous substance presenting all the characters of the foregoing. When the distilled liquor no longer gave any reaction of alkaloid, the residue was evaporated and dried, then treated as before with chloroform, with the same result.

After treatment with chloroform, absolute alcohol removed a small quantity of resin similar to that which was deposited spontaneously by the distilled liquor. The residue, of a fine yellow colour, yielded nothing to ether. The greater portion of it dissolved in boiling water, the insoluble portion being formed almost entirely of excess of lime. The aqueous solution deposited upon cooling a small quantity of white matter, which was converted by calcination into carbonate of lime. The author was not able to determine the nature of the dissolved substances, among which there was a considerable quantity of an organic acid.

The quantity of the alkaloidal substance obtained was too small to allow of a chemical examination of it; but M. Byasson concludes from his experiments that the active principle contained in jaborandi leaves is a liquid, viscous, aromatic alkaloid, having an acrid and bitter taste, and capable, like nicotine, of being carried over in distillation by the vapour of water in the presence of ammonia. The method by which it was obtained shows that it is soluble in chloroform, ether, absolute alcohol, ammoniacal water, and dilute acids; also that it is displaced by ammonia, and that ether removes it from aqueous solution.

M. Byasson proposes to call this new alkaloid "jaborandine;" but, as this name has already been appropriated to the alkaloid obtained from a species of *Piper* referred to before (see p. 178), the anticipatory suggestion of Mr. Holmes that it should be called "pilocarpine" seems to be preferable.

The Alkaloid and Active Principle of Jaborandi. A. W. Gerrard. (*Pharm. Journ.*, 3rd series, v., 865, 965.) The author succeeded in isolating from jaborandi an alkaloid having the full medicinal effects of the drug. At Mr. Holmes's suggestion, he gives it the name *pilocarpine*; the term *jaborandine* having been already appropriated for an alkaloid, discovered by D. Parodi, in another kind of jaborandi (see the previous article). The alkaloidal character of this active principle was proved by its behaviour to phosphomolybdic acid, phosphomolybdate of soda, iodohydrargyrate of potassium, and ammonia.

He recommends the following process for its preparation:—

Prepare a soft extract, either of leaf or bark, with 50 per cent. alcohol. Digest this with water, filter, and wash. Evaporate the

filtrate to a soft extract, cautiously add ammonia in slight excess, shake well with chloroform, separate the chloroform solution, and allow it to evaporate; the residue is the alkaloid pilocarpine with probably a small amount of impurity.

The alkaloid, as at first obtained by Mr. Gerrard, was amorphous, and its soft nature made it appear doubtful whether it would yield itself in a crystalline condition. Subsequent results, however, dispelled these doubts. A quantity of the alkaloid weighing 45 grains was prepared. To this distilled water was added, and dilute sulphuric acid drop by drop, until the alkaloid was nearly dissolved and the solution was neutral. The solution was set aside to evaporate slowly. At the end of three days it had become of a syrupy consistence, with no appearance of crystallization; in three days more, the portions adhering to the side of the capsule presented a granular appearance; a portion placed upon a glass slide, and examined under the microscope, showed with a high power a few prismatic crystals. After four days further waiting it failed to yield itself as a definite crystalline substance. A fresh portion of the alkaloid was now prepared, and divided into two parts; one was neutralized with hydrochloric acid, the other with nitric acid, and set aside. In twenty-four hours they were examined; the nitric acid solution had yielded a mass of fairly well-defined colourless crystals, with a substratum of light brown coloured matter; the hydrochloric solution presented no crystals. At his earliest opportunity, the author submitted the crystals of nitrate to Dr. Sidney Ringer, who was glad to receive them for the purpose of applying the therapeutic test which should be final as to their identity with the active principle and alkaloid. The following is the report of Mr. L. S. Jameson, Dr. Ringer's assistant.

"At 1.45 p.m., gr. ss. of crystals of nitrate of pilocarpine was given to patient, his temperature 99.4, and pulse 104, dinner having been taken one hour and a half previously. No visible effect till 2.30 p.m., when face and chest became more flushed, and a slight perspiration broke out over the same parts. In about five minutes the whole body was covered with a profuse perspiration, the patient at the same time spitting a large quantity of saliva; temperature 98.8, pulse 100, and no effect upon the eyesight. The salivation and sweating continued till 7.20 p.m., both much diminishing during the last three quarters of an hour. After this patient got up and dressed himself, feeling very thirsty, otherwise perfectly well.

"No difference in sphygmographic tracing taken before and during sweating."

Following is a report of its action upon the eye :—

“At 11 a.m., a drop of solution of nitrate of pilocarpine, gr. i. to ʒi., put into each eye; in about twenty minutes pupils were contracted to about the size of an ordinary pin's head. No pain or uncomfortable sensation produced.

“Before administration patient could not read more than a word here and there of $4\frac{1}{2}$ Snellen's Test Types, when held at the end of the bed, a distance of five feet.

“When pupils contracted to above size, she could read the whole paragraph, continually and with ease, four feet beyond the end of the bed.

“Same results obtained in another case when the same solution was used, but distances at which patient could see were not measured.”

Besides the alkaloid, jaborandi contains an acrid resin before mentioned, tannin, volatile oil, and chlorophyl. The acrid resin is soluble in ether, and possesses properties which indicate it to be the substance by which the effects of its external application are produced.

The author promises to continue his researches on this interesting alkaloid, and states that Dr. Attfield will make a chemical analysis of it as soon as a sufficient quantity in a pure condition is obtained.

Since writing the above, the author succeeded in obtaining a complete crystallization of the hydrochlorate of pilocarpine.

Erythroxyton Coca. E. B. Shuttleworth. (*Canadian Pharm. Journ.*, November, 1874.) Some time ago, a sample of coca leaves, weighing several pounds, was forwarded to the writer, accompanied by a request that experiments should be made with a view of determining the most eligible form in which the drug might be administered. As the coca plant is coming more frequently into notice, and as its powerful remedial properties favour the idea that, sooner or later, it will be introduced into the “Materia Medica,” he offers a record of the result of these experiments, together with that of others made for the purpose of ascertaining the best formulæ for possible preparations of the drug.

Niemann (*Arch. Pharm.*, ciii., 120, 291; *Chem. News*, July, 1869) made a proximate analysis of the plant, and gives, as its constituents, a crystallizable basic substance (cocaine), a volatile odoriferous substance, a peculiar tannin (cocatannic acid), and a waxy body, termed coca wax.

Stanislas Martin (*Journ. de Pharm.*, 1859, 283) found a peculiar

bitter principle, extractive, chlorophyl, a substance analogous to theine, and salts of lime. *Maisch* (*Amer. Journ. Pharm.*, 1861, 496) was led to think that the leaves contained a volatile alkaloid. This supposition was subsequently confirmed by *Lossen* (*Ann. Chem. Pharm.*, cxxi., 347), who isolated this principle, and, at the suggestion of *Woehler*, who was associated with him in these investigations, named the new alkaloid hygrine. *Lossen* also found that cocaine, when heated with muriatic acid, was decomposed, benzoic acid and a new base, *ecgonine*, being produced. This fact operates against attempts to extract cocaine with acid liquors, and its importance was recognized by *Lossen*, who recommended the abandonment of *Niemann's* plan, in which acidulated alcohol was employed, and the substitution of infusion with simple water.

Cocaine, which has been described by *Watts* (*Dict. of Chem.*, i., 1059), "crystallizes in small colourless inodorous prisms, having a slightly bitter taste." It is sparingly soluble in water, more soluble in alcohol, and still more so in ether. It is strongly alkaline, dissolves in dilute acids, and neutralizes them completely. It fuses at 98° C., and is decomposed at higher temperatures, yielding ammoniacal products. In most of its reactions cocaine resembles atropia, but that with carbonate of ammonia is different, and the melting points of the two alkaloids are not coincident. The formula assigned to it is $C_{16}H_{19}NO_4$.

Hygrine, the other alkaloidal constituent of coca, assumes, at ordinary temperatures, the form of a thick oil, of yellowish colour. It possesses a strong alkaline reaction, a burning taste, and an odour of trimethylamin. It combines with hydrochloric acid, forming a deliquescent salt. It is to some extent soluble in water, and dissolves readily in alcohol and ether. It does not appear to be poisonous.

The points which bear directly on the subject of this paper, and which are embodied in the above particulars, are, that coca contains two active principles on which its medicinal virtues depend; that one of these is mutable in the presence of acids, the other volatile, and therefore liable to be dissipated by heat; and that both are soluble in water and alcohol. It is probable that both exist in the plant in combination with some acids, as the addition of a little lime or alkali developes to a much greater extent the characteristic taste, and also the activity of the drug. A simple infusion is, however, often employed, and the full effects of the medicine appear to be realized from its administration. This is the oldest, and almost the only preparation of coca which has

been used, and to this attention may with propriety be first directed.

Infusum Cocæ.—Take of coca, bruised, one ounce; boiling water, ten fluid ounces. Infuse in a covered vessel for an hour, and strain.

This preparation resembles in appearance and odour an infusion of ordinary green tea. Its taste is slightly bitter and alkaline, recalling infusion of spearmint. The benumbing sensation experienced when chewing the leaves, is not so perceptible in this infusion. By applying to the dregs a slight pressure, about eight ounces of liquid may be recovered. Each ounce of the preparation will therefore be equivalent to a dram of the leaves. The dose may be from one to two fluid ounces.

Ext. Cocæ Aquosum.—Coca in moderately coarse (No. 40) powder; water a sufficiency. Macerate the coca with four times its weight of water for 12 hours, at a temperature not exceeding 120° F. Transfer to a percolator, and exhaust with water. Evaporate, by means of water bath, to the consistence of an extract.

The extract, thus prepared, is of a dark brown colour, and bitter but not very characteristic taste, 100 parts of leaves yield 36 parts of extract. The dose may be from 15 to 30 grains.

Ext. Cocæ Alcoholicum.—Coca in moderately fine (No. 50) powder alcohol, sp. gr. .838, a sufficiency. Moisten the powder with alcohol, and pack tightly in a percolator. Add alcohol, and continue the percolation until the powder is exhausted. Evaporate the percolate, by means of a water bath, at a temperature not exceeding 150° F., until the extract is of proper consistence.

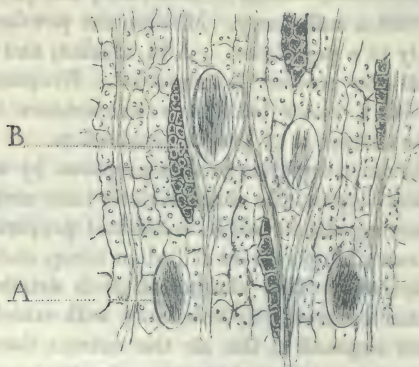
This extract is much superior to that prepared by water, possessing, in the highest degree, the characteristic taste and odour of the plant, and possessing also in full its medicinal properties. It is of a green colour, resembling extract of Indian hemp, and is apparently resinous in character. This characteristic is attributable to the coca wax or other concrete oily substance with which the extract is mixed. When exposed to the air the extract does not harden, but slowly attracts moisture, becoming, in time, quite liquefied. This extract may be regarded as one of the best forms in which coca can be administered. It can be readily formed into pills, and is perfectly reliable. The product from 100 parts of the leaves is 15 grains. The dose may be from 10 to 20 grains.

Ext. Cocæ Fluidum.—The author has not yet made any experiment upon this preparation, but suggests as a menstruum alcohol of sp. gr. .835 or .838; the reservation of a portion of the percolate equivalent to three fourths of the weight of the leaves employed;

and evaporation of the remainder, at a temperature not exceeding 150° F.

Tinct. Cocæ.—A tincture containing four ounces of coca to one imperial pint of proof spirit, or diluted alcohol, may be prepared by percolation, but such a preparation does not appear to be advisable or necessary. The large quantity of alcohol which each dose would contain, might entail therapeutical complications which it would be well to avoid. For administering the drug in a liquid form, the infusion will be found as simple and reliable as any, and by the addition of a small quantity of alcohol—say one eighth part—it might be preserved from change for a reasonable length of time.

Microchemical Examination of Angustura Bark. P. Cazeneuve. (*Répertoire de Pharmacie*, 1874, 261; *Pharm. Journ.*, 3rd series, v., 1.) The author has been engaged in a microscopical investigation of the physiological characteristics presented by true angustura bark and that of *Strychnos nux-vomica*, and also of the variations in their behaviour when treated with nitric acid. He states that if a transverse section of true angustura bark, cut as thin as possible, be moistened with a little glycerin, and examined under the microscope, irregularly scattered groups of much thickened cells will be



TANGENTIAL SECTION OF TRUE ANGUSTURA BARK.*

A, Raphides of Oxalate of Lime; B, Cells containing granular matter (Cusparin?).

seen. The false bark, examined under the same conditions, presents two distinct zones of these sclerogenous cells, which are entangled with one another, as may be seen in sections cut in various directions.

* The woodcut of this illustration was kindly lent by the editor of the *Répertoire de Pharmacie*.

The examination may be carried further, by taking a very thin tangential section, cut perpendicularly to the medullary rays, placing it upon an object glass, and moistening it with a small drop of distilled water in such a manner that the water overflows the tissue but very slightly when compressed by the upper glass. With a magnifying power of 270 diameters, grains of starch may be seen in the cells of the liber parenchyma; and here and there, in the same tissue, large ovoid cells filled with acicular raphides consisting essentially of oxalate of lime. (See fig., A.)

There are also groups of rounded cells, the appearance of which recalls the appearance of a perpendicular section of the medullary rays in the woody tissue of dicotyledons in general. These groups of cells (B) contain a granular substance, soluble in alcohol, ether, and acids, and insoluble in alkalis and in water.

If, by means of a glass rod, a drop of nitric acid be applied round the edge of the glass, the acid by capillary action will spread between the two plates of glass to the narrow zone of water which surrounds the tissue. Upon the junction of the two liquids, it will be possible to watch under the microscope the progressive action of the nitric acid. The oxalate of lime is dissolved, as might be expected. When the granular substance before mentioned, which the author considers to be cusparin, is reached, it melts in each cell, with disengagement of gas, into a reddish liquid, which finally disappears with excess of acid. In the false *angustura* bark, the action of the nitric acid appears in contact even with the aqueous zone, showing the solvent action of water upon the brucine compound. The colour produced resembles the tint of the hæmoglobin of blood; it spreads rapidly through the tissue, which becomes impregnated with it throughout. By using nitrous vapour upon a perfectly dry section, and avoiding great excess of vapour, which might condense and lead to the diffusion of the colour, the author found that the active principle of the *Strychnos nux-vomica* is contained in the inner liber cells.

If a thin section of the suberous layer of false *angustura* bark be treated with nitric acid, then dipped in glycerin, and afterwards examined under the microscope, it presents rounded cells, empty of contents, and coloured a beautiful green on the sides; this colour is gradually modified, and passes definitely to a yellow. The suber of true *angustura* bark is not modified by the action of nitric acid.

The above-mentioned characteristics of the two barks may thus be summarized: cells containing oxalate of lime are numerous in the true bark, but absent from the false one; the red coloration by

nitric acid is localized in the true bark but general in the false; the suber layer of the true bark is not coloured by nitric acid, whilst that of the false is coloured emerald green.

Hæmatoxyli Lignum, Microscopical Characters of. H. Pocklington. (*Pharm. Journ.*, 3rd series, v., 221.) We have here, as in pterocarpus, the structure common to leguminous stems. The cross section is seen to be composed of bands of woody fibres, and woody parenchyma, with ducts divided radially by well developed medullary rays, of which some are much wider than others. In hæmatoxyton the rays generally are much wider than in pterocarpus, and some other stems of the order; and the alternating bands of woody fibres and woody parenchyma have a much more regular sequence in the former than in the latter stem. The minute structure of the various tissues can only be satisfactorily made out in carefully cut sections after they have had the colouring matter removed. The wood fibres are prosenchymatous. The cells composing the woody parenchyma are much larger than in pterocarpus, have thinner walls, and are not so conspicuously pitted, and the borders of the pits are smaller as compared with the pits themselves. The squarer cells of their tissue are much more pitted than the longer cells. The ducts are larger than in pterocarpus, they have bordered pits smaller than in pterocarpus, and sometimes a spiral fibre, single or double, may be seen as a ternary deposit of later formation than the borders. The septa are much thickened and often imperforate, when they might be mistaken for sclerenchyma cells within ducts. The cells of the medullary rays are unusually long, and have thick porous walls. The structure of the wood appears to be subject to rather fewer variations than pterocarpus.

Guaiaci Lignum, Microscopical Characters of. H. Pocklington. (*Pharm. Journ.*, 3rd series, v., 221.) This wood, as everybody knows, is characterized by its exceeding hardness and toughness. The latter characteristic is explained by the peculiar arrangement of its wood fibres, which are much thickened, of the true prosenchymatous type, and interlace with each other in a somewhat anomalous fashion. The cross section appearance of the wood is as follows. The wood cells are small, nearly wholly filled up, and divided into narrow radial bands by the medullary rays, which are usually composed of but one cell. The ducts are single, much thickened, and nearly circular. They are distributed irregularly, but are rather more numerous near the borders of the annual accretions. Examined in detail, the tissues are as follows:—

(a) Wood fibres. These are long, tough, liber-like fibres, dis-

tinctly porous, with spindle ends, and more or less curved (like a boomerang); successive formations of this tissue interweave themselves with the preceding, forming an interlaced tissue, which does not readily cleave in any direction. The fibres adhere exceedingly firmly to each other, and the use of strong nitric acid is necessary if we wish to isolate the cells sufficiently for exact examination of them. (b) Ducts. The cells forming these were short, not much longer than broad, and minutely porous. They are much thickened, and coloured by the guaiacum resin. (c) Medullary rays. These, as has been said, consist of one, rarely two cells superposed, in series of five, rarely more, and are composed of oblong cells with thickened porous walls.

Pterocarpi Lignum, Microscopical Characters of. H. Pocklington. (*Pharm. Journ.*, 3rd series, v., 221.) This is a very different type from the last. The cells generally are much more thickened, and their arrangement quite distinct. The structure is that of leguminous trees. Bands of woody parenchyma of considerable width are interspersed with bands of wood fibres. The ducts are single, round, or sometimes double, of moderate size, excepting near the annual rings, where they are very large, and charged with colouring matter. The rays are usually composed of one cell, sometimes of two, and much less frequently in isolated rays, of eight to ten cells. The single celled rays are composed of rather larger cells than the others, and are arranged in perpendicular layers of seldom more than eight to ten cells. In other respects than of number, the rays are of the same character. The wood cells are long and narrow, considerably thickened, and minutely porous on the sides nearest the rays or woody parenchyma cells.

The woody parenchyma cells have many points of interest, and are very characteristic. They are of two kinds, one much longer than the other. Both are much thickened, and very distinctly pitted, the pits having very well defined borders. The pits are oblong or oval, and oblique to the length of the cell, and are most numerous on two opposite sides of the cells. Frequently on the other two sides at right angles to the direction of the radius, the pits are nearly absent, and have no borders. This is particularly the case in those cells that approach to the wood fibres most nearly in appearance. The shorter nearly square cells are the most distinctly pitted, but in other respects resemble the long ones.

The ducts are all porous, with well defined bordered pits, similar to those of the cells last named. The smaller ducts are rather shorter than the larger, but are otherwise quite similar. The septa

in both have frequently been destroyed, and annular *hernia* show their position. The larger cells show traces of a disrupted spiral fibre, which is sometimes much thickened. The cells of the medullary rays are generally much longer than broad, and have rounded ends. Some few are nearly circular, and in section parallel with the rays. The cross section of nearly all is oval or round.

Quassia Lignum, Microscopical Characters of. H. Pocklington. (*Pharm. Journ.*, 3rd series, v., 321.) The tissues of which this wood is composed are somewhat thin-walled minutely pitted wood cells of the parenchymatous-prosenchyma order, with, intermixed with them, sometimes arranged in bands, thicker walled, but still thin, woody parenchyma cells, often containing single prismatic crystals. The medullary rays are composed of one, more frequently two to four, oblong porous cells. The ducts are generally in twos and threes, irregularly distributed, and generally occupying nearly the whole space (laterally) between the rays, their environment of woody parenchyma often pressing the rays out of their direct path. The porous cells round the duct very generally contain prismatic crystals.

As seen in longitudinal radial section, the appearance is as follows, with slight variations as regards their order in different specimens, as the woody parenchymatous bands are irregular in their distribution. (a) Bands of woody fibres, thin walled, oblique, sometimes nearly square ends, minutely porous, and without spiral fibre or very obvious markings of any kind, the pits being very minute. These cells evidently are of the type called parenchymatous-prosenchyma, but resemble the prosenchymatous class more than the parenchymatous. (b) Ducts and their environment. The ducts are large, closely pitted with small oval pits, often light brown in colour, and square ended, with frequent septa. They are usually four to five times as long as broad. The surrounding cells are short pitted cells, with somewhat thick walls. (c) Bands of woody fibre. (d) Bands of woody parenchyma. These are long, thin walled, porous cells, minutely pitted, and sometimes contain, with granular proteinaceous matter, small prismatic crystals, of which one crystal occupies the cross section of the cell. With these cells are small nearly square cells of the same class, of which each contains one crystal. Then follow bands of woody ducts, etc. It must be noted that this sequence is not invariable, but that the general character of the wood is that it is composed of thin walled wood cells with interspersed woody parenchyma, and ducts with crystal-bearing cells.

The cells of the medullary rays are about five times as long as

broad, are minutely pitted, and contain crystals of the same class as those found elsewhere, but smaller.

Sumbul Root. (*Chem. and Drug.*, 1875, 115.) This root appeared first in 1835, at the fair of Nijni-Novgorod. In 1869, the naturalist, Fedchenko, met with the plant which furnished it on the mountains of Sarafschan, in the khanate of Bokhara; it had no flowers, which led him at first to mistake it for a fern. The specimens sent to Moscow flourished there, and Prof. Kauffmann described the plant as *Euryangium Sumbul*. A microscopical examination of the root was made by M. Tchistiakoff, and these two researches were the subject of a dissertation by M. Petournikoff in *Botan. Zeitung von Mohl und Schlechtendahl*. M. Petournikoff observed that the genus *Euryangium* cannot be separated from the genus *Ferula*, the differences being too minute, and he proposes to call this plant *Ferula Sumbul*. It is cultivated at the present time in many botanical gardens in Russia, but the soil, or rather the humid climate, is not favourable for its extensive growth. Sumbul root is esteemed in the East on account of its agreeable odour.

The Sumbul Plant. M. Wobst. (*Gardeners' Chronicle*.) The author states that he has this year succeeded for the first time in raising the sumbul plant (*Euryangium Sumbul*, Kauffmann) from seed, in the Moscow Botanic Garden. He sowed the seeds in the autumn of last year in a dung bed, and covered them up later with snow and lights; they freely germinated in the spring. One notable characteristic is the manner of the development of the first leaves, which appear below the cotyledons, a peculiarity not infrequent in *Anagallis arvensis*, several species of *Euphorbia*, *Antirrhinum*, etc., and previously observed in some species of Umbelliferæ. Mr. Wobst has found that the sumbul invariably dies after once flowering; of all the plants that have flowered with him, not one has thrown up a second flower.

Note on New Zealand Kauri Gum. M. M. Pattison Muir, F.R.S.E. (*Journ. Chem. Soc.*, August, 1874.) This gum or resin exudes from a tree (*Dammara Australis*) belonging to the family of pines. It is largely imported into this country for the purpose of making varnish.

The sample examined was in the form of a hard, brittle, yellowish white mass, which could be easily cut with a knife. By rubbing, the surface became highly polished, being at the same time electrically excited.

Here and there throughout the mass non-transparent milky blotches occurred. The fracture was conchoidal. Specific gra-

vity = 1.042. On treating the powdered gum with water, part of it dissolved, but the greater portion remained unacted upon. This insoluble portion was partially dissolved by alcohol, in which solution the addition of water caused a white turbidity.

About 52 per cent. of the original substance was found to be soluble in boiling alcohol, while the residue was almost entirely dissolved by digestion in ether at the ordinary temperature.

The alcoholic solution of the gum showed a slightly acid reaction; traces of benzoic and succinic acid were also discovered.

From these reactions "kauri gum" appears to be a mixture of resins (probably more than one) and true gum: hence it may be classed among the gum-resins. The following are some of the reactions of this substance with reagents:—

1. Strong nitric acid, aided by gentle warming, attacks kauri gum violently, the products of the reaction being a yellowish white solid mass, and a small quantity of a reddish liquid. The solid substance is but slightly soluble in hot alcohol or in hot ether, the liquid gives a yellow flocculent precipitate when thrown into water.

2. Concentrated sulphuric acid dissolves the gum, forming a clear red liquid, from which a white semi-solid substance precipitates on the addition of water. If heat be applied, sulphuric acid partially decomposes the gum, at the same time forming a dark coloured liquid, in which water causes no precipitate.

3. Bromine and chlorine both attack kauri gum violently, dense fumes being evolved, the product in the former case being a blackish mass, which dissolves in alcohol, with formation of a red liquid. In the latter case carbon only remains.

4. Caustic potash or soda when boiled with this substance causes it to swell up, and eventually to form a light yellow hard mass, only a very small quantity of the gum being dissolved.

When kauri gum is subjected to dry distillation, it melts, froths up, and gives off dense fumes along with a quantity of a heavy oil, which is of a brown colour, and exhibits a green fluorescence.

Accompanying this oil is a considerable amount of water. The yield of admixed oil and water amounts to about one half of the original amount of gum; the residue in the retort is a thick dark red liquid, which solidifies on cooling to a brittle transparent solid mass.

After drying the oil by means of calcium chloride, and subjecting it to distillation, it was found that less than one half distilled over below 320° C., and that the remainder solidified when cool into a substance resembling that which remained after the distillation of the

original gum. Of the oil boiling below 320° , the greater portion was found, by repeated fractionation, to boil between 155° and 165° , while a small quantity boiled between 270° and 290° .

The oil boiling between 155° and 165° was nearly colourless, had a resinous odour, was immiscible in water, but soluble in a tolerably large amount of alcohol. Its specific gravity at 20° was $\cdot 854$. On analysis it gave the following numbers:—

$\cdot 172$ gram gave $\cdot 216$ gram water = $\cdot 024$ gram hydrogen = $10\cdot 90$ per cent.

$\cdot 172$ gram gave $\cdot 499$ gram carbon dioxide = $\cdot 136$ gram carbon = $79\cdot 07$ per cent., leaving $7\cdot 03$ per cent. of oxygen.

These numbers would lead to the formula $C_{10}H_{20}O_7$, but the quantity at the author's disposal was so small that he did not feel inclined to definitely admit the correctness of this formula until further experiments have been undertaken.

Hydrochloric acid gas changes this oil into a dark greenish brown liquid.

The quantity of kauri gum which the author obtained from New Zealand was too small to admit of further experiments being carried out, but he intends to resume this investigation on receiving a further supply.

The Adulterations of Opium. Dr. A. Christison. (Abstract of a communication presented to the Museum of Science and Art, Edinburgh; *Pharmacist*, Feb. 1875, p. 54.)

Opium adulterated with an extract [or decoction of *green poppy heads*, is detected by the colour and odour, also the smoothness of the opium when rubbed down upon a porcelain plate. When adulterated with *poppy petals*, the smell of the opium is sour and disagreeable, and can be detected when rubbed on a plate with the point of the finger.

Opium, when adulterated by tobacco, or its preparations, can be detected by the odour given off when slightly heated.

Catechu can be detected by exhausting the opium with boiling water, filtering through paper, and testing the filtrate with a solution of sesquichloride of iron. If catechu, or some other astringent adulterant, is present, a black precipitate will result. When adulterated with *gum*, the addition of strong alcohol to a concentrated infusion of the opium will produce a thick flocculent precipitate.

The admixture of *flour* is a very ingenious adulteration, as thereby the general appearance of the opium is very little changed. It can easily be detected in a decoction made from such an adulterated opium by the addition of a solution of iodine.

The same is applicable when opium is adulterated with *bruised potatoes*; at the same time the lumps of the potato are made visible by rubbing down the opium on a porcelain plate, with a small quantity of water.

Sugar is easily detected, when present, by the frothing of a decoction when shaken, and also by Trommer's test.

Opium, when adulterated with *charcoal, carbonate of lime, sand, mineral and earthy matters*, can be readily detected by smoothing a little of the moistened opium on a glazed white surface with the point of the finger, and by separating these insoluble impurities by means of boiling water.

When opium is mixed with fragments of vegetable fibre, cloth, paper, leather, etc., the admixture is evident to sight and touch, when rubbed down as above; the magnifying glass is also a great auxiliary in determining the character of the adulterant.

American Eupatoria. Dr. J. M. Bigelow. (*Detroit Review of Medicine*, and *London Medical Record*; *Pharm. Journ.*, 3rd series, v., 303.) The genus *Eupatorium* in the United States comprises about thirty-two species. Three have been found exclusively in the eastern States, five in the southern States, and eleven in the far west. Four species have been found common in the three grand divisions of the States, and nine are common to the eastern and southern States. Of those known to possess medicinal or toxicological properties, one (*E. sessilifolium*) is exclusively eastern, one (*E. incarnatum*) is exclusively southern, four (*E. perfoliatum*, *rotundifolium*, *teucrifolium*, and *aromaticum*) are common to the eastern and southern States, while two (*E. purpureum* and *ageratoides*) are common to the whole United States.

Eupatorium perfoliatum is officinal. Its history and properties are well described in Wood and Bache's *United States Dispensatory*. *Eupatorium teucrifolium* and *sessilifolium* possess similar properties, but appear to be milder in their operation than *Eupatorium perfoliatum*. The root of *Eupatorium purpureum* has bitter, aromatic, and astringent properties, and enjoys the local reputation of being an excellent diuretic as well as tonic.

Burnett, in his "Outlines of Botany," mentions that *Eupatorium rotundifolium* is useful in consumption. It grows in dry soil near the sea-coast, from Rhode Island to Louisiana.

Eupatorium incarnatum and *E. aromaticum* contain an aromatic principle similar to, if not identical with, coumarin, first obtained by Guibourt from *Coumarouna odorata*, Aub. (*Dipterix odorata*, Schub.), or Tonka bean. This principle, or one very similar, seems

to pervade many plants, such as *Melilotus officinalis* and *M. cerulea*, *Asperula odorata*, *Trifolium melilotus*, *Anthoxanthum odoratum*, *Liatris odoratissima*, and probably many others. It is, without doubt, this principle which gives fragrance to *Eupatorium incarnatum*, *E. purpureum*, *E. aromaticum*, *E. odoratum*, etc. *Liatris* is a genus of composites, very closely allied to *Eupatorium*, and all species with aromatic fragrance and tuberous roots have long been known to possess active diuretic properties.

Professor Lindley, as long ago as 1848, mentioned the fact that bloody urine from inward contusions had been cured by coumarin, obtained either from the flowers of melilotus or the Tonka bean. This principle, besides being diuretic, is decidedly antispasmodic, and has been used by Dr. Cooper, of Philadelphia, in cases of pertussis.

There is a large class of troublesome diseases connected with inflammation and irritability of the bladder, in which the coumarin obtained from these plants (reasoning from analogy and the little experience we have already had of this substance) might be expected to produce decidedly beneficial results. Dr. Cooper gave to children of five years five to eight grains in a dose, prepared in the form of a fluid extract, with the happiest soothing effect upon the nervous system, which renders it worthy of a more extended trial.

Prof. Wood ("United States Dispensatory," 389, 13th ed.), with regard to the peculiar bitter principle of the *Eupatorium perfoliatum*, remarks that, when it is isolated and satisfactorily determined, the name eupatorin will be proper; but he does not seem to remember that there are other species of *Eupatoria*, possessing other and very different properties, and that some of them may have a peculiar principle isolated and satisfactorily determined before the *E. perfoliatum*, and will then be entitled to priority in the name. Under these circumstances, it would be manifestly improper to apply it to the peculiar principle of *Eupatorium perfoliatum*. Already we see eupatorin (*perfoliatum*) and eupatorin (*purpureum*) advertised; but as yet neither of them is entitled to the name, as both are only concentrations of the several proximate principles, and not one peculiar to either of them. Eclecticism has a great penchant for the application and appropriation of scientific names; and among a large number of absurdities, we see *cerasin* and *prunin* advertised, which, if true alkaloids, as their names scientifically indicate, would be one and the same thing.

Eupatorium ageratoides, known popularly in some regions as white

snake-root, is used by the eclectic physicians of Ohio as an anti-spasmodic, diuretic, and diaphoretic. In cases of nervous disease it is given in dram doses, in the form of infusion.

But the greatest interest centred in this plant results from its having been suspected of being the cause of "trembles" in cattle, and of "milk sickness," a severe and sometimes fatal disease of very local extension, making its appearance in the early settlement of isolated regions in south-western portion of Ohio. It pervaded also portions of Indiana, Illinois, Kentucky, and Tennessee. Like the old-fashioned tertian ague, it has disappeared entirely upon the clearing up and cultivation of the land, which also destroyed the abundant prevalence of the weed. The late Wm. S. Sullivan, a distinguished botanist of Ohio, writing upon this subject in 1840, says that "this weed, hitherto considered harmless, has lately become the suspected cause of the fatal disease among cattle commonly called the 'trembles.' The disease prevails in many localities in the western States, and is always accompanied by another, equally fatal to the human species, known by the name of 'milk sickness.' It is generally believed they are both produced by the same cause originally, whatever that may be. A prevailing opinion is that some vegetable produces it. The poison-ivy (*Rhus toxicodendron*) has been strongly suspected by many, among them the late Dr. Drake, of Cincinnati. Mr. John Rowe, of Fayette County, Ohio, asserts that he has been successful in investigating this obscure subject. It was with the *Eupatorium ageratoides* that experiments on some cattle were made by him, in the presence of highly respectable witnesses. The disease was produced, and the cattle died from it. An account of the experiments, together with the certificates of the witnesses, was published in the *Ohio State Journal* of 1840. The details were not given as particularly as could be wished."

Mr. Sullivan was careful to ascertain that this was the plant used in those experiments, and also examined and identified specimens procured by Mr. T. Roberts, who was well acquainted with all the circumstances. He was assured also by Dr. Drake, of Cincinnati, to whom Mr. Rowe sent specimens, that it was the *Eupatorium ageratoides*. A difficult point to settle in this case is, that this plant, and likewise the poison-ivy, is very abundant in many places where these diseases are not and never have been known. Mr. Sullivan was better acquainted with the geographical botany of the west than any other individual; and never having seen or heard of any plant peculiar to such infected localities, he therefore concludes that the origin of the disease will not be traced to any particular

plant, and especially the plant in question, as it is found growing in the east, west, north, and south.

Besides the Eupatoria above enumerated, there are eleven or twelve western species, of whose properties little or nothing is known. One among them, *Eupatorium Berlandieri*, common all over Texas, New Mexico, and extending into Eastern Mexico, Dr. Gray says, is aromatic, and nearly allied to *Eupatorium aromaticum*; so that, if further known, some might be found worthy of a place in the materia medica.

Oleum Aleuritis Trilobæ. Dr. Calixto Oxamendi. (*Medical Record*, June 16, 1875; abstracted from the *Anales de Medicina de la Habana*.) The author describes the therapeutic action of the oil of the candleberry tree, which he considers may be used as a good substitute for castor oil.

The *Aleuritis triloba*, commonly called in India "candlenut," or "candleberry" tree, is a large euphorbiaceous tree which grows in India and all intertropical countries. The oil produced from the nuts of this tree is used for different industrial purposes. The native of Ceylon calls it "kekune oil," and it is known in England under the names of "nut oil," or "artist's oil."

Very little has hitherto been said about the therapeutic properties of this plant; nothing can be found on the subject in the works treating of materia medica. A short notice is, however, given in Griffith's "Medical Botany." This author says:—"The nuts of the *Aleuritis triloba* are considered to be aphrodisiac when used in small quantity and in a dry state; they have laxative properties when taken in larger quantity and in a fresh state." In one of his "Annales de Thérapeutique," M. Bouchardat says that the oil of *Aleuritis triloba* has purgative properties in a dose of thirty grams. Renato de Grosourdy expresses the same opinion in his work on medical botany, but he thinks the oil must be used in a dose of sixty grams in order to move the bowels.

Following the indications of Bouchardat and Grosourdy, Dr. Oxamendi has employed the oil of *Aleuritis triloba*, and his results are not quite conformable with those arrived at by his predecessors. Having once given this medicine to a healthy negro woman, he obtained an effect much stronger than he expected. By subsequent experiments, he arrived at the conclusion that the oil must be employed in much smaller doses, and that half an ounce is quite sufficient to move the bowels of an adult.

The oil of *Aleuritis*, Dr. Oxamendi thinks, may be used with advantage as a substitute for other aperients. It greatly resembles

castor oil in its effects on the bowels, but it is by no means disagreeable, and has a pleasant taste of hazel nuts. It acts quickly (about three hours after its administration) and very gently, without giving pain and griping.

With respect to the physiological action of this aperient, Dr. Oxamendi thinks the laxative effects are not only due to the disturbance produced in the bowels by the oil itself, but also to a special resin which irritates the intestinal mucous membrane.

The nuts of the *Aleuritis triloba* are so oleaginous that they yield nearly half their weight of oil. The dose of the oil is two drams for a child, or half an ounce for an adult. The following mixture is recommended by Dr. Oxamendi:—

R	Olei Nucis Aleuritidis Trilobæ	3 ss.
	Gummi Arabici	3 iij.
	Aq. Communis	3 iij.
	Sacchari Albi	3 ss. M.

Good results are also reported to have been obtained by friction with the following liniment over the abdomen in cases of rebellious constipation or abdominal pains:—

R	Olei Nucis Aleuritidis Trilobæ	3 ss.
	Tinct. Cantharid.	} 3 iij.
	Ammon. Carbon., aa	
M.	Linimentum.	

Note on Japanese Oil of Peppermint. John Moss, F.C.S. (*Pharm. Journ.*, 3rd series, v., 366.) The sample of oil reported upon was presented to the museum of the Pharmaceutical Society by Messrs. Cyriax & Farries. It is part of a parcel which was received from Japan in a cylindrical tin canister, along with a bottle of the liquid oil, a specimen of which is presented to the museum by Messrs. Corbyn & Co.

It appears that in 1862 a memoir on crystallized oil of peppermint, from Japan, was presented to the Chemical Society by Oppenheim. This chemist speaks of the substance coming to this country in considerable quantity in earthenware jars, and of its being adulterated with sulphate of magnesium, to which it has a close resemblance in crystalline form, to the extent of 10 to 20 per cent. This, however, is not the case with the sample examined by the author, which, if not absolutely pure, is at least free from all impurities not derived from the original oil.

Oppenheim called the subject of his experiments *camphor*, or *stearopten* of *peppermint oil*, and also *menthol*. In Dr. Attfield's

“Manual,” peppermint camphor is styled hydrous menthene, *menthene* ($C_{10}H_{18}$) being the hydrocarbon which is known to be common to several, if not all, varieties of peppermint oil. Oppenheim found that his camphor fused at $36^{\circ}C.$, and boiled at $210^{\circ}C.$; that it was very slightly soluble in water, very soluble in alcohol, ether, bisulphide of carbon, fatty and essential oils, and in alcoholic solutions of the caustic alkalies; from the soda solution it crystallized in long needles. It was insoluble in aqueous alkalies. It liquefied in a current of hydrochloric acid or of sulphurous acid gas, resuming the solid crystalline character unchanged on exposure. From solution in strong acids it was separated by water as an oil, which soon solidified with properties unchanged. Having repeated these experiments, the author has no hesitation in saying that the present specimen, if not the identical body examined by Oppenheim, is a physical isomer of it; for he finds that it fuses at $39^{\circ}C.$, resolidifies at $37.5^{\circ}C.$, and boils at $215^{\circ}C.$ It should be stated, however, that the boiling point remained stationary for some seconds at $210^{\circ}C.$, so that there is the probability of this specimen being a mixture of Oppenheim’s camphor with a more condensed body having higher fusing and boiling points. There may be a number of such isomers, for Dumas, by exposing at $0^{\circ}C.$, American oil of peppermint, which resembles the Japan oil in furnishing crystals at a relatively high temperature, obtained crystals which, when purified, fused at $25^{\circ}C.$, and boiled at $208^{\circ}C.$ In other characters they resemble the crystals from Japan oil. By exposing the liquid Japan oil to cold for some days (a great part of the time below $0^{\circ}C.$) no crystals were obtained. It is therefore probable that this oil has already yielded such as it is readily capable of doing. This is indeed what might be expected, for it is not easy to see the object of sending both crystals and liquid into the market, if the original product does not spontaneously deposit the former, and so give an inconvenient mixture of solid and liquid. Both Oppenheim and Dumas concur in ascribing the formula $C_{10}H_{20}O$ to the bodies they examined. Time, or the want of it, has not permitted the author to verify this. The menthol from spearmint described by Gladstone has the formula $C_{10}H_{14}O$. It boils at $225^{\circ}C.$ Oppenheim considers, on very good grounds, that the body from Japan oil is a monatomic alcohol, $C_{10}\overset{H_{19}}{H}\}O$, *menthylic alcohol*, or *hydrate of menthyl*.

In an experiment with liquid Japan oil, it commenced boiling at $206^{\circ}C.$, the temperature rose to $210^{\circ}C.$, where it was stationary for

some time, and finally reached to 218° C. This, therefore, is a mixture of two or more bodies; but as menthene, according to Oppenheim, boils at 163° C., this hydrocarbon does not enter into the mixture.

Crystallized *Chinese Oil of Peppermint* is mentioned in the work *Pharmacographia*, recently issued by Mr. Hanbury in conjunction with Dr. Flückiger. It is there referred with reserve to *M. arvensis*. Oppenheim distinctly gives *M. piperita* as the source of the camphor he examined, and he does not hint at a Chinese origin. It is stated in *Pharmacographia*, that to distil *M. arvensis* with *M. piperita* ruins the flavour of the oil yielded by the latter plant.

Thus there appears to be strong positive evidence that *M. arvensis* is not the source of Japan oil, for this oil is not greatly inferior to the best Mitcham oil in point of fragrance.

Boldo. M. Claude Verne. (Abstract of a treatise presented to the Ecole Supérieure de Pharmacie de Paris; *Pharm. Journ.*, 3rd series, v., 405.) Several notices which have appeared during the last few months in the medical and other journals have directed considerable attention to a new Monimiaceous medicinal plant, popularly called Boldo. It is an alpine shrub, met with frequently in the Chilian Andes, where the sweet mesocarp of its fruit is eaten; the bark is used in tanning, and the wood is esteemed for charcoal making. It has at various times been described by botanists under the names *Peumus fragrans*, Pers., *Ruizia fragrans*, R. et P., *Boldoa fragrans*, C. Gay, *Boldea fragrans*, Tul. But as it was described so far back as 1782 by Molina as *Peumus boldus*, Baillon considers this latter name has the right of priority. The properties attributed to the plant are that it acts as a stimulant to digestion, and has a marked influence on the liver. The discovery of these alleged virtues is said to have been due to the beneficial effects which followed the shutting up of a flock of sheep suffering from liver disease within an enclosure which had been recently repaired with boldo twigs. The sheep are reported to have eaten the leaves and shoots, and recovered speedily. The leaves are the portion of the plant used in medicine, for the sake of an aromatic oil they contain; but up to the present time only a very small quantity, if any, has been received in this country. In France, however, the plant has been the subject of physiological and therapeutic experiments by Dr. Dujardin-Beaumetz, and of an elaborate investigation by M. Claude Verne, from which the following details have been taken.

Materia Medica.—The boldo tree, which formerly was met with

only in the mountains, grows now upon the cultivated districts, and embellishes them with its green foliage and flowers of a yellowish white colour. It is never met with in a forest, but always grows isolated. In good soil its development is rapid. It is indigenous to the New World, and has a very restricted area, not having been met with outside Chili. This tree has a height of from five to six metres, and is an evergreen, having cylindrical branches, bearing cylindrical opposite branchlets. The thin bark is adherent to the wood, corrugated longitudinally, of a clear brown colour, and very aromatic; the wood, on the contrary, is only slightly aromatic. The leaves, green when fresh, change in drying to a reddish brown. They are coriaceous, with prominent midrib, veins alternate, sometimes opposite, and covered on their surface with small glands. The leaves are opposite, entire, and oval, and when chewed leave a fresh aromatic taste; their odour recalls that of the Lauracæ and Labiatæ. The flowers are diœcious, in racemes placed at the end of the branchlets, of a pale colour, and contrast well with the shining green leaves. The yellowish green fruit (which must not be confounded with that of the *peumo*, or boldo, of the Lauracæ sold in the markets of the country) has an aromatic, succulent, sweetish mesocarp, which is eaten, and the very hard kernels are made into necklaces by the Chilians. The first specimen of boldo leaves was sent into France, for experimenting in diseases of the liver, by the house of Fabian, of Chili.

In South America the plant is well known as an aromatic, and infusions prepared from it are prescribed as digestives, carminatives, tonics, and diaphoretics. It is also a popular remedy against syphilis and diseases of the liver. The dried leaf, reduced to powder, is used as a sternutatory.

In the small family of Monimiacæ there are two other new plants, which are said to possess properties analogous to those of boldo, viz., *Atherosperma moschata*, Labil., and *Nenuraron Vieillardii*. The bark of the first in decoction is considered to be a powerful tonic and antiscorbutic. As a weak infusion, either alone or with milk, it is used instead of tea, and in that form has an aperient action. The bark of the second has a strong camphoraceous odour and intensely hot taste, and is chewed by the Kanacques as a digestive and powerful stomachic.

Histology.—The essential oil of boldo is contained in special cells, which are met with in nearly every part of the plant. The author had the opportunity of studying histologically portions taken from a tree growing in the botanical garden of the Ecole de Médecine,

Paris. A transverse section of the limb of the leaf showed the following characters :—

The upper epiderm has one, two, or sometimes three rows of cells, especially in the neighbourhood of the insertion of some hairs which originate in the second row. These hairs are simple, rarely bifid, in form like birds' claws, conical, arched, and lie parallel to the surface of the leaves. The inferior epiderm, pierced all over with stomata, has but a single row of cells, and its stellate hairs, of the same form as the preceding, sometimes penetrate beyond the epidermic tissue into the parenchyma. The parenchyma is divided into two zones, one having oval-oblong cells, gorged with chlorophyl, the principal axis of which is perpendicular to the surface of the upper epiderm; the other having polyhedric cells, less green than the others, containing in the interior thinly scattered grains of chlorophyl. Both zones are furrowed by the fibro-vascular tissue proceeding from the nerves of the lamina, and in the second moderately large lacunæ frequently occur. The vessels containing the essential oil are found principally in the latter zone; rarely they occur in the former.

The oil vessels differ in shape from the neighbouring cells, being perfectly spherical and of a greater diameter, and this form remains the same in whatever part they are found. There is no trace of chlorophyl in the interior, but sometimes the thick enveloping membrane retains small green granulations, and the rest of the cavity is filled with a refracting liquid. In places where this membrane has been cut by the razor, its texture appears close, firm, and transparent, and the liquid may be seen protruding beyond the envelope. This liquid is white and transparent in the green leaf; in the dried leaf it has a yellowish green tint, and does not fill all the cavity, being divided into little drops, imprisoned at the bottom of the organ.

Chemical Examination of the Plant.—Some leaves mixed with portions of the stem, coarsely powdered, were placed in a displacement apparatus, and treated successively with ether, alcohol, and distilled water. Treated with ether they yielded an essential oil (2 per cent.), alkaloid (trace), citric acid, and a considerable quantity of aromatic substances. To the alcohol they yielded a small quantity of essential oil, alkaloid (abundantly precipitated by double iodide of mercury and potassium), citric acid, sugar, and aromatic matters. To the distilled water they yielded sugar, gum, lime, citric acid, and tannin.

The most abundant product yielded by the plant is the essential

oil, as much as two per cent. having been obtained in repeated operations. This proportion, however, is small, when compared with the amount of thick black aromatic matter which is left at the bottom of the retort, and is probably due to oxidation of the oil. In distillation, a certain quantity of oil, having an odour resembling that of the plant, passes over at 185°C .; the thermometer then rises gradually to 230°C ., and after remaining stationary a few moments, rises to 300°C . The products of distillation collected at 230°C ., and between 230°C . and 300°C ., compared with the first product, have a greater density and a stronger odour, but the odour is always that of the whole plant. This shows that the volatile oil of boldo, like most vegetable aromatics, is a mixture of several bodies. It is worthy of note that the authors failed to obtain more than a trace of the oil by distilling fresh leaves and stems taken from a plant grown in Paris.

The essential oil has no reaction upon litmus paper. It is very slightly soluble in water, to which it communicates its flavour, and gives a slightly acid reaction. It is very soluble in rectified spirit, and the mixture will burn with a bright flame; alone it burns with a fuliginous flame. The crude oil is at first strongly coloured, but after rectification it loses its colour, and becomes a clear yellow, and has a fresher odour. It does not form a solid compound with bisulphite of soda (no aldehyde). It is coloured hyacinth red by sulphuric acid, violet by nitric acid, red by potash, and is decolourised by hydrochloric acid. The addition of iodine causes at first a sharp effervescence; then the iodine disappears in the mass, which is coloured, and considerably thickened.

The discovery in this plant of an alkaloid (boldine) by the author in conjunction with M. E. Bourgoin, and the method for obtaining it have been already published (*Pharm. Journ.*, iii., 323; *Year-Book of Pharm.*, 1873, 97).

Pharmacy.—The following forms are suggested by the authors as suitable for the administration of the active principles of this plant:—

Alcoholic Extract.—100 grams of leaves coarsely powdered are exhausted in a displacement apparatus by 400 c.c. of 60° alcohol. The alcohol acquires a warm taste, and is reddish black in colour. Evaporated, it gives 20 grams of dry extract, dark red, with a greenish tinge, and having a hot, sweetish bitter taste.

Aqueous Extract.—100 grams of contused leaves are macerated during twenty-four hours, in a water bath, with sufficient distilled water to leave 1000 grams at the end of the operation. The mace-

rate filtered has a reddish colour, a slightly sweetish bitter taste, and gives upon evaporation in a water bath 15 grams of extract.

Essential Oil.—As in other essential oils, the strong odour and burning taste render this oil difficult of administration. The author has prepared it in the form of *perles* containing each 11 centigrams of oil. He has also introduced an ethereal tincture into *perles*.

Tincture.—100 grams of contused leaves are macerated during eight days, with occasional stirring, in 500 grams of 60° alcohol, and filtered. The product is deep red, with a slightly green tinge.

Wine.—30 grams of contused leaves are macerated during twenty-four hours in 60 grams of 60° alcohol, and 1000 grams of Madeira wine added. After eight days' further maceration, with occasional stirring, the marc is pressed and the product filtered. The wine possesses in a high degree the aromatic properties of the plant.

Syrup.—100 grams of contused leaves are infused during six hours in 1000 grams of water in a covered vessel; they are then strained and pressed, and 950 grams of sugar added to the liquor, in which it is dissolved by the aid of a covered water bath. This syrup is very aromatic, and appears to be easy of administration because of its agreeable taste.

Elixir.—200 grams of contused leaves are treated by displacement with 1500 grams of 60° alcohol. The entire quantity of alcohol is recovered by the addition of a small quantity of water, the amount of which is noted. Afterwards the quantity of water is increased to 600 grams, with which a weak decoction is prepared from the exhausted leaves. With the decoction and 600 grams of sugar a syrup is made, which is mixed with the alcoholic tincture. After twenty-four hours the product is filtered through paper. In the above preparations the leaves deprived of their stems, and the bunches of stems, sometimes bearing the flower, are employed. The young wood is also aromatic, and more bitter than the leaves.

These preparations are said to have been administered with success, in the Hôtel Dieu and Hôtel Beaujon in cases of atony of various organs when the patients have been unable to tolerate quinine. Care, however, is required in their administration, as vomiting is provoked by large doses. Dr. Beaumetz commences with fifty centigrams of alcoholic tincture in a julep, and this dose may be increased to two grams daily. The dose of the more dilute and more agreeable wine is a spoonful to a wine glassful once or twice daily.

Gurjun Oil in Skin Diseases. Prof. Erasmus Wilson. (From the *Medical and Surgical Reporter*.) At a meeting of the Medical Society of London, the author showed some of this remedy (known also by the name of gurjun balsam or "wood oil"), and stated that it is an oleo-resin, obtained from several species of *Dipterocarpus*, an immense tree growing on the Malayan coast of the Bay of Bengal, where it was so common as to be used instead of paint for houses and ships.

About twenty years ago this oil was introduced into England as a substitute for copaiba balsam, and was reported to have the same medicinal properties. Opinion was, however, divided on this point, and the gurjun oil did not succeed in securing a place in the Pharmacopœia. In March, 1873, Dr. Dougall, of the Indian Medical Service, took charge of the convict establishment of the Andaman Islands, when he found twenty-four of the prisoners suffering from leprosy. He was deeply impressed with the misery of these poor people, and realizing the impracticability of availing himself of all known methods of treatment, he hit upon the idea of trying the gurjun oil, both as an internal and external remedy, and determined upon giving it a six months' trial. He closed the experiment in November, by a report, which was kindly placed in Mr. Wilson's hands by Sir Ranald Martin, and used in his lectures before the College of Surgeons. Dr. Dougall's method was to have the patients washed thoroughly in a neighbouring stream, using dry earth instead of soap. They were then made to rub themselves for two hours with a liniment composed of gurjun oil and lime water, one part to three, and to swallow ʒij. of the balsam also combined with lime water. After this they had their breakfast, and were set to any work they were capable of doing. In the evening the same process was repeated, except the washing. The effects of this treatment, at the end of six months, were marvellous. Neuralgic pains were allayed, sensibility was restored to the anæsthetic skin, tubercles subsided, and ulcers healed. Dr. Dougall was astonished at the energy of these formerly helpless ones. Mr. Erasmus Wilson remarked that he had used a liniment composed of equal parts of the gurjun oil and lime water, in cases of painful eczema, in lupus, and in cancer, with very encouraging results, and stated that Mr. Hancock had applied it in a case of cancer of the skin, with the effect of dispersing tubercles and healing ulcerations; but its most useful property was that of relieving pain. A lady in constant pain from cancer of the integument who had been unable to sleep, without narcotics, for weeks, was relieved of all suffering, and enabled to

sleep, by means of this liniment. Mr. Wilson suggested that this very simple remedy deserved a trial at the hands of the profession, and believed that it would be found a valuable agent of cure in many affections where the skin was painfully attacked.

More recent reports from the Andamans have afforded such additional evidence of the value of gurjun oil as a cure for leprosy, that the Marquis of Salisbury, on behalf of the government, has called particular attention to this mode of treatment, with the view of giving it the widest possible publicity, inviting at the same time the co-operation of all the local governments and administrations towards the extension of its use, with the request also that careful reports on the results may be submitted at the end of a year. (See *Pharm. Journ.*, 3rd series, v., 510 and 729.)

Japanese Vegetable Wax. (From the *Journ. of the Society of Arts.*) The *Japan Mail* contains some further particulars respecting the preparation of the vegetable wax produced in Japan and chiefly exported to England. This wax is obtained from the fruit or, more correctly, berry of the wax tree. The tree, which is by no means unlike the juniper tree, flourishes more especially in the southern provinces of the empire. The fruit, which usually ripens about the month of October, is gathered when ready, and cleansed from its loose outer husk, a process which is accomplished in large wooden vessels, with wooden malls, similar to those in use for cleaning rice. The residue product, available for the manufacture of wax, is a beanshaped kernel of the size of a lentil, possessing an unusual degree of hardness, of a dark yellow wax colour, and offering a saponaceous exterior to the touch. The kernel is subsequently exposed in a sufficient degree to a steaming process, which deprives it of its extreme hardness, and allows of its oily properties being more easily extracted in the pressing stage. In this process the oil is received into small earthen vessels, in which it subsequently hardens to a bluish green mass, in the shape which it is commonly met with in home consumption.

Wax so produced is impure, and is only suitable for certain descriptions of candles and for wax-thread manufacture for home use. In order to render it merchantable for the exporter, the following refining process is resorted to:—The wax is boiled with a lye until it is brought to a perfectly fluid state, and is then drawn off into a reservoir filled with clear water, the pure wax, which floats upon the surface, being removed.

The mass is then exposed to the sun's rays for a period of fifteen or sixteen days, during fine weather, for the purpose of bleaching it,

at the expiration of which time the wax presents a dirty white crumbling appearance and a strong tallowy smell. The boiling and bleaching are repeated with the view of rendering the refining process still more complete, the only difference being that, instead of lye, pure water alone is employed in boiling it. The product is a clear white powder, which, in place of its former crumbling appearance, has assumed an almost crystalline formation. The last stage of preparation for export consists in rendering the powder a compact mass, which is effected by melting it over a fire with a little water (in order to avoid burning), and running it off into flat vessels. The product thus obtained, and known to commerce as vegetable wax, differs exceedingly little from white beeswax, with which it possesses the properties of colour, brittleness, and similarity in its fan-shaped fracture in common. The only characteristic difference may be said to be in the odour, the beeswax giving off a refreshing aromatic scent in burning, while the tallowy smell of the Japanese wax is far from being agreeable. Vegetable wax is chiefly used in England in the manufacture of wax candles.

Henna. M. G. Delchevalerie. (*Gardener's Chronicle*, from the *Belgique Horticole*.) Two very distinct varieties of the plant are cultivated in Egypt. The first, *Lawsonia spinosa*, differs from *L. inermis* by its very spiny branches and much finer leaves. This is used in making garden hedges; and a fragrant distilled water is prepared from its blossoms. The henna is one of the favourite flowers of the Egyptians, and during its time of blossoming they ornament their rooms with it.

The second form, *L. inermis*, has much larger leaves than the former, and the branches are without spines. It is increased by suckers, and large tracts of ground are closely planted with it under trees in half-shady places. The green stems are cut several times a year, and stripped of their leaves, which are dried and reduced to powder, and thus form an article of commerce, under the title of henna powder. The plants, which are cut down almost to the ground, soon throw out fresh shoots, which are cut with a sickle like the first, and several crops are thus yielded during many consecutive years.

The culture of henna is easy, and might probably be carried on successfully in Italy and Central France. The variety *inermis* is that which is employed as a dye plant in Egypt.

To obtain the flowers the shrub is not pruned, but is allowed to attain the height of two or three metres when it flowers in the second year. To obtain the colouring principle, however, it is sown or

planted very thickly, and the branches are mown as soon as they have reached the height of a metre.

Henna has been in use among the Egyptians from the most ancient times, the leaves having been employed in medicine as well as a cosmetic. The ancient writers mention its astringent and tinctorial properties. Dioscorides mentions it under the name of cyprus. "The cyprus or ligustrum," he says, "is a tree which bears leaves resembling those of the olive, but longer and softer, and of a greener colour. Its flowers are white and fragrant, growing in downy bunches. Its fruit is black, and resembles that of the elder." The name of "cyprus," which the henna formerly bore, doubtless originated from the fact that the Greeks obtained it from the island of Cyprus, the Cyprians having formerly monopolized the trade in this colouring matter.

Pliny says that the cyprus of the Egyptians is a tree with leaves like those of the zizyphus, seeds like coriander seeds, and white fragrant flowers. The most esteemed and the dearest comes from Canope, on the banks of the Nile; the second from Ascalon in Judæa; and the third (taking them according to the sweetness of their odour) from the island of Cyprus.

Prosper Alpinus states that invalids procure ease by inhaling the perfume of the flowers of henna, and applying them to the forehead. The Moors, who were well acquainted with this quality, made very extensive use of the flowers for this purpose. The same author says that the natives of Egypt prepared with the leaves a powder called archenda, which was used by the women for dyeing their feet and hands of an orange colour, as a means of enhancing their charms. If our women, he adds, would apply this secret to rendering their hair golden, they would not need to expose their heads to the heat of the sun and to many other painful methods of ensuring this result. It thus appears that the recent rage for golden hair, like most other fashions, has nothing of novelty to recommend it.

Olivier says that the henna (which the Jews call *hacoper*) furnishes flowers of a penetrating odour, and that an aromatic water was obtained from them by distillation, which was employed in baths, and as a perfume in religious ceremonies, such as marriage, circumcision, and the feast of Courban-Bieram. The Jews had also a custom of sprinkling the flowers of henna on the garments of the newly married.

The ancient Egyptians made use of henna for the purpose of perfuming the oils and unguents with which they anointed the body with a view of obtaining suppleness. They also employed it in

embalming; and flowering branches of henna are found in mummy cases.

Avicenna compares the properties of henna with those of dragon's-blood. He says that its leaves possess the same property of curing ulcers, and that a decoction of them is employed in cases of inflammation and burns, and as a remedy against ulcers of the mouth. Forskal, in his "*Flora of Egypt*," refers to the medical and tinctorial properties of henna. The leaves are dried and reduced to powder, being first mixed with fine sand, which causes them to divide more easily. This powder is used in dyeing, and is an article of considerable commercial importance. It is used in colouring the nails and hands, as also in giving a red tinge to the hair; and it is thus used by old men for dyeing their grey beards. When it is desired to dye the hands with henna, the powder is formed into a paste, and applied during the night. In the morning the hands are washed, and then anointed with oil to give them greater brilliancy. If a browner hue is desired, the juice of unripe acorns is added to the paste.

Bellonias remarks that henna was an important object of commerce among the Turks, who exported it from Alexandria to Constantinople, where the trade in it was considerable. The Grand Seigneur, who had a monopoly of this traffic, derived from it annually the sum of 18,000 ducats. At the present day Egyptian henna is largely exported from Alexandria, and, according to the official report, 18,385 cwt. was shipped from this port alone during the Coptic year 1588 (or 1873), the official value of this quantity being 900,000 piastres.

The colouring principle, which is known as hennotannine, is very abundant in the leaves of henna, and might probably be advantageously used in manufactures. It is still employed by men and women for dyeing the palms of the hands and the nails of the hands and feet of a reddish orange; the hair and tails of horses and asses are also coloured with it; and it has other uses in Egypt which are of minor importance.

The Botanical Source of Medicinal Rhubarb. (*Gardeners' Chronicle*, March 27th, 1875.) In the January number of *Regel's Gartenflora*, M. Maximowicz gives a description and some historical notes on *Rheum palmatum*, var. *Tanguticum*. He does not dispute the fact that *Rheum officinale* of Baillon (figured in the December number of the *Botanical Magazine* of last year) yields a commercial rhubarb, but contends that the drug known in England as Turkey rhubarb, which came to England through Siberia by way of

Kiachta before the strict supervision of the Russian government shut it out from the British and other European markets, is the produce of the plant he describes. Maximowicz's plant was collected by Przewalski, in 1872-3, in the vicinity of Lake Koko Nor, North-west China. It is, or was, extensively cultivated in that district, and the wild plant was also collected. An account is given of the method of its cultivation and preparation, but this part adds little to our knowledge of the requirements and conditions necessary for the profitable cultivation of rhubarb. The plant figured agrees in all respects with a specimen in the Kew Herbarium labelled "*Rheum palmatum*, from Pallas," and also with another from Dr. Lindley; and there seems little doubt that the account given of its previous introduction about 125 years back is correct. The Russian officials stationed on the frontier were instructed to obtain seeds or plants of the genuine rhubarb if possible; and in 1740 they succeeded in obtaining a quantity of seed, though they had to pay a high price for it. But the "heathen Chinese" was too crafty for them, the plants raised from this precious seed proving to be nothing more than the well-known Siberian *R. undulatum*. However, in 1750 the true plant was procured, and from Russia it spread over various parts of Europe, including Britain; so after all we have, according to Maximowicz, been seeking for a plant we already possessed. He goes on: "Let it be admitted that we now possess two species which furnish a superior quality of rhubarb, still *R. palmatum* has the advantage of being the genuine plant that produced the drug whose reputation dates from the time of the Arabian and Greek physicians."

Adulterated *Serpentaria*. P. L. Milleman. (*Amer. Journ. Pharm.*, 4th series, iv., 511.) Twice within the past year the author noticed the presence of large quantities of golden seal in *serpentaria*. The condition in which *serpentaria* is found in the market is generally in a loose or unpressed state. Its long twisted and knotted rootlets, together with a surplus amount of earth (a fact to be remembered), facilitate the adulteration; for in case the golden seal should become broken during handling, it would expose the trick; but, the adhering earth becoming loosened and intermingled with the roots, the fraud is not so easily detected.

The rhizomes, with rootlets attached, of the golden seal were found, by measurement, from one quarter to one inch in length, and rarely exceeding one eighth of an inch in diameter.

They averaged over two ounces to the pound of *serpentaria*.

Bitter Principle of Wild Cherry Bark. J. L. Williams. (*Amer.*

Journ. Pharm.) The author did not succeed in completely isolating the bitter principle of wild cherry bark. The following process gave the most satisfactory results :—

An aqueous infusion of the bark was concentrated, filtered, mixed with an equal volume of alcohol, and, after standing for twelve hours, filtered. The liquid was treated with milk of lime, the filtrate evaporated to a syrupy consistence, a large quantity of alcohol added, and the filtrate evaporated. The residue was exhausted with boiling alcohol, which on spontaneous evaporation yielded a transparent brownish residue, of a somewhat gelatinous aspect. It possessed a bitter taste, was insoluble in ether, soluble to a limited extent in water, more soluble in alcohol, particularly if heated. Concentrated sulphuric acid coloured it brown-red; cold nitric acid had but little effect upon it.

Cypripedium Acaule, Lin. H. Northam Bryan. (*Amer. Journ. Pharm.*) The attention of the author was attracted to this plant from observing persons engaged in collecting its subterraneous portion, and, upon inquiry, being informed that it was to be used as an emmenagogue; afterwards, the effects of this rhizome with rootlets were tested in several instances with apparent success. The drug, when fresh, has a rather strong and heavy odour and a bitter taste, and in the dry state is of a dark brown colour.

Only a limited quantity of the material could be procured for experimental purposes; from the results of which it appears that it yields, on distillation with water, a minute quantity of volatile oil; to carbon bisulphide and to alcohol, some resinous matter, which is wholly soluble in ether; and to ether about ten per cent. of solid matter, which is only partially dissolved by alcohol, the insoluble portion giving a blood-red colour with sulphuric acid. The presence of tannin, sugar, and starch was likewise proved.

Actæa Alba, Bigelow. William Dilmore. (*Amer. Journ. Pharm.*) This plant is popularly known under the name of white cohosh, white beads, Noah's ark, and necklace weed. The rhizome with the rootlets, which is the portion medicinally employed, has at first a sweetish bitter, afterwards acrid taste, followed by a peculiar irritating sensation upon the fauces.

The distillate with water possessed the odour of the root and a slight taste. The infusion and decoction were found to contain albumen, gum, sugar, starch, and extractive, but neither tannin nor gallic acid. The alcoholic tincture contains two resins having the acrid taste of the root, both of which are soluble in alkalies and reprecipitated by acids, while ether dissolves one only. After the

concentrated tincture has been precipitated by water, and the resins filtered off, the liquid froths considerably on agitation, and contains a principle analogous to saponin, which may be obtained in a still impure condition by evaporating the liquid, extracting the residue with diluted alcohol, decolourising by animal charcoal, and agitating with ether, which on spontaneous evaporation yields a brown, translucent, and brittle substance, having a bitter and acrid taste. It is soluble in alkalies, water, diluted and strong alcohol, and assumes with warm sulphuric acid a rose colour, changing to purple, and finally violet.

On Kamala. C. Schneider. (*Archiv der Pharmacie*, 3rd series, v., 57.) The author thinks that the German Pharmacopœia goes too far in requiring kamala to be free from sand, and that it would be better to fix the maximum amount of sand allowable in this substance. Some time ago he met with a sample of kamala yielding 41 per cent. of ash, and this circumstance induced him to examine a number of different samples of this drug obtained from various wholesale houses of high repute. He obtained the following results:—

No.	Percentage of Ash.	Soluble in H Cl.	Sand.
No. 1.....	4·966	1·551	3·415
„ 2. . . .	21·603	3·249	18·354
„ 3. . . .	21·747	3·357	18·390
„ 4. . . .	24·540	3·756	20·748
„ 5. . . .	26·086	6·704	19·377
„ 6. . . .	26·233	4·007	18·739
„ 7. . . .	27·005	6·382	20·623

Considering the low price of kamala, it is improbable that sand is added to it as an adulterant. It must be supposed, therefore, that the collection of the glands, and their separation from the fruits of *Rottlera* is conducted in an unclean and careless manner, or that the fruits become covered with sandy dust while still on the tree, and that the varying percentage of sand in the glands depends on their exposure to or protection from the wind, and is thus due to accidental circumstances.

Of the seven samples examined, only No. 1 approaches the requirements of the Pharmacopœia, and as the percentage of sand in the ash of this sample was lower than that in any of the others (68·726 against an average of 81·228), the probability is that it had been purified by elutriation. The mineral matter soluble in HCl contained in No. 1 amounts to 1·551 per cent.; but whether this

is to be looked upon as an integral constituent of the glands, or as belonging to external impurities (dust), remains doubtful.

The author tried the effects of elutriation in order to see whether it would yield a preparation of such a purity as is required by the Pharmacopœia. He moistened 74 grams of kamala, containing 24.54 of mineral matter, with rectified spirit, then suspended it uniformly in water, and allowed the mixture to stand for half an hour, during which the kamala separated into two layers, an upper one floating on the surface of the water, and weighing 14 grams, and a sediment amounting to 60 grams. The former showed a considerable increase of the objectionable tufted hairs, and a decrease of mineral matter; the latter an increase of mineral constituents and a decrease of hairs, parenchyma, etc. The upper portion yielded 14.65 per cent. of ash, consisting of 7.65 per cent. of sand and 7.00 per cent. of matter soluble in H Cl. The ash of the sediment amounted to 26.85 per cent., of which 23.85 per cent. were sand, the remainder (3.00 per cent.) being soluble in H Cl. This shows that the purification of kamala by means of elutriation is impracticable, and as the complete removal of sand—no matter by what process—is exceedingly difficult and troublesome, it seems desirable that the Pharmacopœia should not insist on the absolute freedom of this drug from sandy matter.

That kamala containing a very small amount of sand is sometimes met with in commerce, is proved by sample No. 1; its occurrence, however, appears to be extremely rare. The average amount of sand in the samples examined is 17.097 per cent., and leaving the unusual sample, No. 1, out of consideration, it is 19.377 per cent.

On Balsam of Tolu. R. Carles. (*Journ. de Pharm. et de Chim.*, xix., 112.) By boiling balsam of tolu with water, and allowing the decoction to cool, a large number of crystals are formed. As to the nature of these crystals there exists a great diversity of opinion. According to Guibourt they consist of benzoic acid and cinnamic acid. Kopp mentions resin, volatile oil, cinnamein, and cinnamic acid, as the constituents of the balsam. Scharling and Riche maintain that it contains free benzoic acid, whereas Pelouze and Frémy could only find cinnamic acid. Girardin gives both benzoic and cinnamic acid as constituents of the balsam; and Litre and Robin state that it contains principally the former, and but little of the latter acid.

Under these circumstances the author thought it necessary to re-investigate the subject; and the results which he obtained show that both the hard and the soft balsam of tolu do not contain a mixture of the two acids, but cinnamic acid only.

The Oils of Chinese Pharmacy and Commerce. Dr. F. Porter Smith. (*Pharm. Journ.*, 3rd series, v., 61.) The word for oil in Chinese is written as a compound of the characters for liquidity and let. Oil thus means with them the "letting liquid," that which removes the hindrance of friction. The enormous demand for oil as an article of daily diet to counteract the binding qualities of rice and other cereal foods, and in pastry making, and the extensive use of varnishes, putties, paints, and pigments in China, lead to the manufacture of oil from all sorts of sources. Oil is exclusively used for lighting purposes in all stationary situations. It also enters into the composition of quack and orthodox plasters, a very favourite application in Chinese medicine and surgery. By the use of night-soil, on an extensive scale, in the form of irrigation, the rapid growth of enormous breadths of Cruciferous plants (a populous order in China) enables the Chinese to obtain large quantities of oil from this source. These colza oils are miscalled olive oil in some European manuals on China. The olive tree is not known in China. Certain extracts are sometimes called oils in Chinese nomenclature. Soy is called an oil.

Oil of Almonds (Sweet).—A bland oil is said by Sir J. Davis to be obtained from the (mixed?) kernels of the apricot or almond trees in North China, but I have never met with it.

Oil of (Star) Anise.—This oil is said by Dr. S. Wells Williams to be prepared from the fruits in small retorts, a hundredweight yielding about seven pounds of the oil. It is pale, warm, and sweetish, and becomes solid at about 50°. It is used as a condiment and cordial in South China, and is exported thence to Europe and the United States. The common anise oil has not been met with by me in China.

Oil of Apricot Seeds.—See Oil of Almonds.

Oil of Beans.—This oil is expressed in large quantities in North China, and at Newchwang, from the *Dolichos Soja* bean, by both natives and foreigners. The oil is often miscalled pea oil, is dark, not very palatable, and has some tendency to cause sickness. It is used in cooking very largely, and is very cheap.

Oil of Benzoin.—A fragrant, oily preparation is sold under this name, but it is not liquid benzoin. Dr. Williams says it comes from India. It is used in making ointments and plasters. It is probably liquid storax, or the rose-maloes of commerce.

Oil of Cabbage.—This oil, a kind of colza oil, is expressed from the seeds of *Brassica Sinensis*, in increasing quantities, all through the valleys of the Yang-tsze and Han rivers. Very primitive

machinery is used for this purpose. The seeds are crushed, steamed, and put into wooden cylinders, usually made by hollowing out the trunks of trees. The oil is squeezed out of the mass placed in coarse bags, by means of wedges driven down by mallets, or by an arrangement similar to that by means of which piles are generally driven into the earth in this country. In the last case water power is sometimes employed. The proportional yield is very considerable. The oil is of a dark yellow colour, thick, and has a pleasant odour. It is used for lamps, in cooking, and as a hair oil. It is laxative, or even purgative to some extent, and is applied to swellings, sores, and ulcers.

Oil of Camellia.—This oil is prepared from the seeds of the capsular fruit of the *Camellia oleifera*, or mountain tea tree, as the Chinese call this shrub, which grows in the same situation and soil as the tea shrub proper, known by the same generic name, *Cha'* or *Ts'a*. This tea oil, as it is miscalled by foreigners in China, is thinnish, yellow, and less fragrant than cabbage oil. Large quantities of this oil come from the hilly districts of Kiang-si and Hunan provinces, where the shrub grows in profusion.

Oil of Camphor.—Oily or uncrystallizable camphor is obtained in the island of Formosa, in the form of a yellow, strong-smelling liquid, which exudes from the crude native camphor, stored in tubs or vats, to the extent of some 3 or 4 per cent. It is scarcely saleable, and is altogether inferior to the oil obtained from the *Dryobalanops camphora*, on the west coast of Sumatra, where the oil dripping from the split timber of the tree, felled to procure the Borneo or Baros camphor, is sold at the price of a Dutch guilder for a large quart bottleful. It would be worth importing to England for use as a cheap substitute for the lin. camphoræ. It answers capitally as an embrocation in rheumatism and sprains.

Oil of Chaulmugra.—This oil is made from the seeds of the *Gynocardia odorata*, or lucrubau fruits. The oil is both cold-drawn and made by superheating the crushed seeds. It is used in leprosy as an outward application, with doubtful benefit, and is useful in the treatment of pediculi and itch.

Oil of Cinnamon or Cassia.—This volatile oil, obtained from the leaves and twigs of the cassia tree by distillation, is made in Canton, and regularly exported. It is the *oleum malabathri* of commerce. This oil is nearly as good as the Ceylon oil.

Oil of Cloves.—A well-made, heavy, acrid oil, of a pale, reddish brown colour, becoming very dark by age and exposure to light. None of these essential oils were known to the old medical writers

in China, and are, therefore, not met with, as a rule, in their Pharmacopœia or Herbal. They are nearly all made at Canton, and are obvious imitations of European articles of commerce.

Oil of Cotton Seeds.—The oil expressed from the seeds of *Gossypium herbaceum*, and *G. religiosum*, is commonly used for purposes of illumination in Chinese country villages, where all wants are met on the spot in the most primitive fashion. It is also used in cooking, but the taste is unpleasant. It is prescribed as a demulcent remedy, and is applied to leprous, scabious, and other forms of skin disease, so fearfully prevalent in China.

Oil of Fish.—The Chinese do not extract oil from the liver of any fish, but there is an oil called *yu-san*, prepared from the entrails, etc., of a fish. The cod has not been met with in Chinese waters. Large quantities of a fish resembling the cod are caught off the coast of the Chehkiang (or Ningpo) province, in the sixth or seventh (Chinese) months. The oil obtained from the porpoise (or "river-pig," as they call it), which frequents the Yangtsze-Kiang river as far up as Hankow, is used to make putty for caulking vessels, and to burn in ship lamps. A yellow oil obtained from a fish, called *hwang-ku-yu*, has a strong fishy smell, and is used to destroy lice. It is much used in veterinary medical practice, a department of the Chinese medical art which has been practised from an early period, and has an ancient and respectable literature of its own.

Oil of Ground Nuts.—This pale yellow oil, having an agreeable flavour, is expressed in large quantities from the seeds of the *Arachis hypogæa*, or underground nut. Hunan province supplies a good deal. It is very cheap, and makes a fair substitute for olive oil. The Chinese samples are much darker than the Indian, which are said by Dr. Waring to have a specific gravity of .916.

Oil of Hemp Seeds.—Several hemp oils, derived from the seeds of a variety of the *Cannabis sativa*, are to be met with in Chinese commerce. Specimens examined were evidently oils obtained from sesamum seeds, or those of the flax plant, both of which are confounded with the hemp plant proper.

Oil of Lilies.—This is cabbage oil, in which the axillary buds of the lily plant have been digested. The oil is recommended to be applied to vesicular eruptions. This very same or a similar preparation was once in great repute in Europe. In fact, to read the Chinese Pharmacopœia of to-day is like reading the old dispensaries of the 17th and 18th centuries.

Oil of Linseed.—The oil of the seeds of a linum is used as a leni-

tive, pectoral, anthelmintic, and alexipharmic remedy, and as an application to scabbed heads. This oil is not easily procurable.

Oil of Myrrh.—A reddish oil, having the smell of myrrh, is said by Loureiro to be used in Cochin China to dress ulcers. The Chinese are fond of making empyreumatic oils of various substances.

Oil of Pine.—A sort of empyreumatic oil, or coarse turpentine, procured by heating the wood or knots of several species of *Pinus*.

Oil of Peppermint.—A very good essential oil is distilled at Canton from the leaves of *Mentha piperita*, *M. crispa*, *M. hirsuta*, and *M. Canadensis*. It is put up in small bottles, holding about a dram. It sells at about 30s. a pound. The Chinese bottles are very poor, and stand a good deal in the way of elegant pharmacy. There are several glass manufactories in the (north-eastern) province of Shantung and at Canton. The bottles are very small and brittle. The Chinese pharmacists decorate their shops with ginger jars and small blue-ware bottles. An oil is prepared at Canton from the pennyroyal plant. Mint is largely used as a remedy in bellyache, but the dried leaves are generally used as an infusion.

Oil of Persimmons.—A glutinous oily extract is prepared from the fruit of the persimmon, a large, soft, orange-yellow fruit, very sweet, and often somewhat acrid. The fruit chosen for making this oil is that of the *Diospyros Embryopteris* or *Embryopteris glutinifera*, which grows plentifully in Hupeh province. The fruits are crushed to obtain the dark, resinous, thick juice, which makes a very capital varnish for the paper kittysols or umbrellas of China. It is very cheap. An extract might be prepared from the fruit, as directed in the Indian Pharmacopœia, where it is prescribed as an astringent.

Oil of Poppy Seeds.—The opium poppy is largely grown in Sechuen, Yunnan, and every province of China. It was introduced from Persia, a great source of drugs sent as tribute to China. Several splendid varieties of the flower are given in old lists of plants. Oil is obtained from the seeds, but I have never inspected a sample.

Oil of Ricinus Communis.—The castor oil plant grows to the height of more than ten feet, and forms a woody stem in Hupeh, but never survives the winter there. There is a red-stemmed variety and a white-stemmed plant, both of which are used to make the oil, which is used in cooking, and is sold for use as a lubricant on board foreign steamers. It is used medicinally, but

not very frequently, as it does not purge Chinamen much, if at all. Croton oil is used by Chinese physicians in apoplexy, a common disease in China.

Oil of Roses.—This essential oil is used mainly as a scent for hair oil, so plentifully used by all Chinese women.

Oil of Sandal Wood.—The Chinese employ this thick, yellow, fragrant oil to daub over common fans, which are then sold as genuine sandal-wood fans.

Oil of Sesamum.—The black and white sesamum seeds are used to make an agreeable oil, much used by the higher classes in cooking food and making pastry. It is credited in the Chinese Pharmacopœia with ecbohic, emmenagogue, and anthelmintic properties. It answers all the purposes of olive oil in the dispensary. It is the til or jinjili oil of India.

Oil of Sunflower.—This oil is known to the Chinese, but is not extensively used or known to be employed in pharmacy.

Oil of Spike.—A fine drying oil, is used in painting on porcelain and for varnishing. It is obtained from the *Lavandula* or an *Ocymum*. The Labiates do not abound in China, but they are held in great repute medicinally.

Oil of Tallow Seeds.—This oil, made from the albumen of the seeds of the tallow tree or *Excœcaria sebifera*, is clear, but of a dark colour. It is obtained, in the proportion of from 15 to 16 lbs. from one hundredweight of the berries, by grinding, steaming, and pressing the refuse which results from the preparation of the vegetable tallow. The oil is used to varnish umbrellas, to dress the hair, and to mix with the tallow to make the candles which form so effective a part of the religious ceremonies of Buddhism, the Ritualism of China. It has emetic and purgative properties. It is one of the few remedies given by the Chinese in cases of poisoning. Efforts are seldom made to rescue those suffering from opium poisoning, a common mode of suicide in China.

It will be observed that the oils of Chinese commerce are almost exclusively taken from vegetable sources. This is one of the effects of Buddhism on their national life and economy. As Buddhism teaches that mercy and pity are noble sentiments, it forbids the destruction of animal life. The flesh of the cow and the sheep is never eaten by orthodox Chinese members of the Buddhist Church. Their wax is, therefore, vegetable, their tallow is vegetable, and their oils are vegetable. Their gelatines are made from sea-weed. Their daily diet is fish, oil, and rice, with an occasional treat of pork.

There are many other vegetable substances, such as gourd seeds, the fruit of the *Aleurites triloba*, etc., from which the Chinese might prepare, or formerly have prepared, vegetable fats, in obedience to their strong religious teachings and highly economic tendencies. Mineral or rock oils are met with in Shansi, Sechnen, and Formosa, and in Corea. They are not used for illuminating purposes, as they are very inflammable, and are said to have been employed in warfare in the composition of a sort of Greek fire.

The Active Principles of the Official Veratrums. C. L. Mitchell. (*Transactions of Amer. Pharm. Assoc.*, 1875.) In a long and elaborate essay on the three veratrums used in pharmacy (*V. viride*, *V. album*, and *V. Sabadilla*), the author records the result of his chemico-physiological study of these plants and their constituents. A full report of his experiments, which is not suited for abstraction, will be found in the *Pharmaceutical Journal*, v., 768, 785, 847, 867, and 886. Here we must confine ourselves to a statement of the conclusions arrived at, viz. :—

1. There exists no such alkaloid as viridine.
2. Bullock's viridine is identical with jervine.
3. There is a distinct alkaloid in *Veratrum album*, differing from both veratroidine and veratrine.
4. The resin of *Veratrum album* is in itself nearly inactive and owes whatever power it may possess to the presence of veratralbine.
5. The alkaloids do not exist in sufficient proportion to be profitably extracted.
6. Jervine does not exist in *Veratrum sabadilla* seeds.
7. Jervine and sabadilline are probably not identical.
8. Couerbe's "Le Veratrin" is a mixture of resin and veratrine.

Senna Tinnivelli, Microscopical Characters of. H. Pocklington. (*Pharm. Journ.*, 3rd series, v., 301.) The structure of the leaves of *Cassia elongata* may be taken as the structure of the true sennas, as the other true species have but slight differences in details of structure from this. The upper epidermis and the lower are furnished with great numbers of small stomata, stiff unicellular pointed hairs, much consolidated and rugose; and their cells are small. Certain of the hairs spring from a slight elevation of the cuticle, composed of dark coloured cells grouped round the base of the hairs.

The structure of the sub-epidermal layers is exceedingly simple, and of the usual type; but the vascular system is highly developed. The midrib and primary veins are of the usual character. With their woody fibre cells are disposed, in strict linear order, great numbers of lozenge-shaped crystals of a lime salt. The secondary

veins, groups of spiral vessels with little or no woody fibre, ramifying in the parenchyma of the leaves, have, however, none of these crystals; but a great number of sphaeraphides are associated with them, and more particularly distributed in the parenchyma between the loops or interspaces of this spiro-vascular system. Having regard to the thinness of the leaves, these inorganic constituents are very numerous.

Buchu Folia, Microscopical Examination of. H. Pocklington. (*Pharm. Journ.*, 3rd series, v., 262.) In some respects these leaves possess the common features of the natural order to which they belong, but in some other respects they are nearly unique. They require careful study, and many points in their structure require much working at with the aid of careful micro-chemical and ordinary chemical (ultimate) analysis. Prof. Flückiger divides the tissues of these leaves into three layers, neglecting the cells of the epidermis. So far the leaves of the three kinds of buchu, *Barosma betulina*, *B. crenulata*, and *B. serratifolia* are agreed; they have minor differences, which will be presently indicated.

The epidermis of the upper surface of the leaves is quite devoid of stomata, and is composed of five and six sided irregularly-shaped cells, not sinuous, and covered externally with a thick layer of the ordinary cuticular substance, which here as elsewhere stains deeply with magenta. Near the margin of the leaves these cells are much elongated, and are also rather modified over the midrib, but to a much smaller extent than is usual. The vertical section of these cells is oblong, and they are frequently much compressed towards the margin of the leaf. Within these cells is the remarkable layer of cells described by Prof. Flückiger. These are, when in their natural conditions, oval cells with their long axis perpendicular, and have very thin walls. They contain but little chlorophyl, in the form of minute granules, and charged with amorphous nearly soluble starch, but much mucilage, which appears to be identical with the mucilage of linseed and quince. If a section of the leaf be placed in an aqueous solution of chromic acid, this layer of cells is seen to swell up gradually with a distinct striation parallel to the surface of the leaf, and a less distinct striation vertical thereto, and determined by the walls of the containing cells. In water the swelling is more rapid, but the striation is not so evident. The swelling continues until the epidermis is forced off, often the inner membrane of the epidermal cell is much torn, and the whole of the mucilage-bearing layer is broken up, and the mucilage dissolved in the water. The cell walls themselves do not dissolve; they simply become broken

up and invisible on account of the close identity of their refractive index with that of the mucilaginous solution. They may be seen floating in small pieces, if the section be previously carefully stained with tincture of iodine, and their reaction throughout is that of pure cellulose. The mucilage itself does not stain with iodine, nor does it give any cellulose reaction. Its reactions, so far as the author has been able to study them, are those of a mucilage contaminated with chlorophylloids, and with other protein matters.

The same swelling occurs in a smaller degree and less rapidly when glycerin is used; essential oils and alcohol have no effect. This layer exists in the three species of *Barosma*, but is perhaps most highly developed, in proportion to the thinness of the leaf, in the thinner leaved species, as the size of the collenchyma cells remains pretty constant through the genus, but varies slightly with the age of the leaf; or perhaps it will be more accurate to say that the mucilaginous contents are more highly developed in the mature than in the young or very old leaves.

Beneath these cells are layers of very small irregularly shaped chlorophyl-bearing cells in which the small veins of the leaf terminate in a remarkable club-shaped expansion. The cells themselves are not remarkable, except on account of their numerous sphæraphides of oxalate of lime, but the nerve-vein terminals are worth much more attention than any one appears yet to have given them, and there is little doubt in the author's mind that they will prove to be absorbent organs of some kind. They are in many respects similar to the "organs" figured some years since by Mr. Herbert Spencer, and found in the roots of certain plants. Beneath this layer we have the loose spongy or stellate parenchyma of the interior of the leaf and the overlying vascular system. There is nothing at all remarkable in the loose parenchyma. The vascular system is very largely developed, and is remarkable for the full development of its terminals in the chlorophyl-bearing tissues. The wood fibres accompanying it are very long, tough, and cord-like. In this tissue are also the remarkably large oil reservoirs so commonly found in the plants of this and a few other natural orders. They are well formed, with several layers of specialized cells, and contain, no doubt, with other matters, the aromatic oil examined by Prof. Flückiger. The lower epidermis lies beneath these, and is remarkable for the great number of two-celled stomata, which are evenly disposed over its surface, except where the oil glands determine a locally modified arrangement. The cells of this epidermis resemble those of the upper except in size, but are subject to more frequent

modifications, (a) by the stomates, (b) by the midrib, and (c) most characteristically by the subjacent oil glands. Above these the cuticle cells are much changed as regards shape, and group themselves in irregular circles, with the gland cell over it as a focus.

Sections of these leaves, immersed in an alcoholic solution of magenta, much diluted with water, form very interesting objects, and much facilitate the working out of many of these details.

Uvæ Ursi Folia, Microscopical Characters of. H. Pocklington. (*Pharm. Journ.*, 3rd series, v., 301.) The leaves of *Arctostaphylos Uva Ursi* have no very remarkable structural peculiarities, and may be dismissed with a very short comment. The upper and the lower epidermis have the same general arrangement of cells, and these are pretty regular in size, excepting near the midrib. They are four to six-sided, with rounded corners, sometimes nearly round, and present when seen in the isolated epidermis, a tolerably regular pattern of rounded off squares or pentagons. There are no stomata on the upper surface. The stomata on the lower surface are curiously grouped. The grouping is determined by the network arrangement of the veins of the leaf. The guard cells are two in number. The inner tissues of the leaf, beneath the epidermal compressed cells and superposed thickening, are several layers of vertical chlorophyl-bearing cells, and the spongy parenchyma, with the vascular system and its wood fibres. With the wood fibres are small square cells, each of which contains a small prismatic or lozenge-shaped crystal of some lime salt. The wood cells are frequently stained with an astringent brown colouring matter, and form a wedge extending from the rib bundle to the surface of the leaf.

It does not appear to be practicable to mount sections of these leaves permanently.

Hyoscyami Folia, Microscopical Characters of. H. Pocklington. (*Pharm. Journ.*, 3rd series, v., 301.) The section of the midrib presents a somewhat similar horseshoe arrangement of the vascular system to that found in tobacco; but the investing layers, and particularly the epidermal appendages, present considerable differences when carefully compared with tobacco.

The midrib is made up of spiral and annular vessels of considerable size and thickness. The associated fibre, or woody parenchyma is very slightly thickened, and with it are associated oblong cells containing an amorphous or semi-granular substance. These cells and their contents are somewhat similar to those described by the author in the petiole of *Cinchona succirubra*, but nothing but

chemical analysis will enable us to say how far their contents are identical.

The secondary vascular system is highly developed, and consists of spiral vessels, which divaricate again and again until a fine network is produced, chiefly composed of single spiral vessels, which ultimately terminate in the parenchyma in small club or swollen ends. In the interspaces of these vessels are great numbers of exceedingly small crystals.

Tabaci Folia, Microscopical Characters of. H. Pocklington. (*Pharm. Journ.*, 3rd series, v., 301.) The structure of the veins and midrib, and the character of the epidermis and its appendages, are the important features in the leaves of the tobacco plant.

The cells of the epidermis are rather large, and have waved outlines. The stomata are rather large, and occur on both the upper and the lower surface, being more numerous on the latter. The hairs on the surface are, however, the most characteristic; they are multicellular glandular capitate, with a peculiar crook or twist.

The structure of the midrib, as is well known, is remarkable for the horseshoe arrangement of its vessels and wood fibres, and the peculiar character of the parenchymatous tissues generally.

As the plant has no very special interest to the pharmacist (unless he be a smoker), it is, perhaps, hardly worth while to go more minutely into the structure of its leaves, which have already been very fully described by other writers.

Maticæ Folia, Microscopical Examination of. H. Pocklington. (*Pharm. Journ.*, 3rd series, v., 301.) The exceeding thinness of these leaves, and their tessellated arrangement, render it very difficult to make transverse sections of them, and there is nothing whatever special in the inner tissues of the leaf until we come to the structure of the midrib and veins. The epidermis is composed of small cells, and is remarkable for the small amount of cuticle substance superposed on it. It is furnished with multicellular hairs, pointed, sometimes capitate, and slightly marked with nearly round punctations on the lower surface of the leaf. The epidermis of the upper surface is very white, and composed of loose cells, with little cuticle. The structure of the midrib is somewhat anomalous, a character common in the Piper family. Four to eight vascular wedges are arranged in a loop three quarters around a medulla situate much nearer the upper than the lower surface of the leaf. Above the portion of the medulla left exposed by the opening of the loop is situated a bundle of woody parenchyma, composed of long, square-ended cells, much thickened by a semiligneous substance

that swells considerably in water, but does not dissolve. It would appear to be nearly pure cellulose modified towards lignin. Outside this is a small layer of parenchyma and the epidermis. Outside the vascular wedges are layers of porous parenchyma cells, and round these variously sized bundles of wood, parenchyma, and the external cells.

The vascular wedges are composed of large porous vessels; spiral vessels, with large thick spirals, sometimes one to three, right or left-handed, sometimes one right and another left-handed in each tube; and of wood fibres and long cells containing various colouring and aromatic matters and octahedral crystals.

The parenchyma between the vascular wedges and the bundles of woody parenchyma is chiefly composed (not entirely) of large round or oval cells much thickened, and marked with bold distinct oval pits.

The structure of the midrib is thus seen to be very characteristic, and to consist really of (1) a ring composed of epidermis; (2) of parenchyma; (3) a ring of bundles of woody parenchyma, separated by masses of the last; (4) a complete ring of modified parenchyma, consisting of the porous cells described, and ordinary parenchyma cells; (5) of vascular wedges arranged in a loop; and (6) of an excentric medulla.

It may be worth while noting that the structure of the aerial stem of *Artanthe* consists of a looped arrangement of vessels and more or less modified parenchyma, but differs from the midrib and petiole in many respects, as is quite usual.

Rhus Venenata, or Poison Sumach, Description and Analysis. Robert M. Cotton. (*Amer. Journ. Pharm.*, 4th series, viii., 335.) This a low, smooth, branching shrub, growing from six to eighteen feet high, and always inhabiting swamps, especially tamarack swamps. Its leaves are compound, dotless, alternate, odd pinnate, and stipulate, with from seven to thirteen obovate oblong entire leaflets. It is most widely known under the common name of poison sumach, though, in some localities, it is known as poison elder.

It is not necessary to give the details of the analysis as Rochleder's process for the analysis of plants was quite closely followed. It is sufficient to say that an acid was obtained from the decoction, which remained after subjecting a quantity of the powdered leaves to distillation for several days. This acid crystallizes in congregated clusters of minute, transparent, triangular prisms; non-volatile, and decomposed by a high temperature. The water solution of these

ystals has a moderately sour taste, and reddens blue litmus quite distinctly. With neutral acetate of lead, it gives a white flocculent precipitate; with chloride of barium, a white granular precipitate which is increased in amount by heat; with calcic hydrate a white precipitate is produced after standing a short time. A large number of other reagents were added, such as nitrate of silver, phosphate of magnesium, chloride of mercury, etc., without producing any precipitates.

It was at first supposed that this acid was the same which Gmelin speaks of in his *Hand-Book* (this being the only work where anything was found in any way touching upon this plant or genus) under the name of rhus-tannic acid, and said to be a constituent of the plants of this genus. But it is found that this acid has none of the properties characteristic of the astringent acids; it has not an astringent taste, and does not precipitate gelatin or iron. Owing to the small quantity of the leaves originally taken, and the small amount of time that could be devoted to the work, the examination could not be further continued.

If so desired, this acid can be obtained in any quantity by boiling the dry powdered leaves with water for some time, straining, expressing, and filtering while hot; then boiling with and filtering through animal charcoal, precipitating with neutral acetate of lead, decomposing the precipitate with sulphuretted hydrogen gas, filtering out the sulphide of lead, then evaporating and crystallizing. The crystals can be purified by recrystallization from water solution, if so desired. It is found by experiment that, in passing the decoction through animal charcoal, the charcoal retains all of the colouring matter with nearly all of the gum, but not taking up any recognizable quantity of the acid.

Other crystals were obtained from portion third of the decoction, after having filtered out the precipitate caused by alum and ammonia, by evaporating the filtrate and allowing it to crystallize. These crystals are deposited needle-shaped, and as long triangular prisms. In shape, they resemble the first-mentioned crystals of this acid, but are very much larger. They have a sharp, salty taste, and are neutral in reaction; are soluble in water, hydrochloric, nitric, sulphuric, and acetic acids; very soluble in ether, insoluble in alcohol, unless added in very large quantities. The crystals suffer decomposition instead of sublimation, and when completely burned leave a small white ash. The possibility of this being a compound formed from any of the reagents added, or by their decomposition, was satisfactorily precluded by special examination for that purpose. It is supposed that this is an alkaline earth in combination with an

organic acid, probably the same acid which was previously obtained separate, though the reactions of these two sets of crystals differ in a few instances.

Adulteration of Beeswax. Dr. A. W. Miller. (*Amer. Journ. Pharm.*, 4th series, iv., 510.) For a year or two past there has been offered in the market an article termed "refined beeswax." It is unusually handsome in appearance, and is generally represented as being strictly pure. It may be known by all of it being of a uniform bright yellow colour, entirely free from the sedimentary stratum of impurities ordinarily found in country wax. Its surface is clean and glossy, having no foreign particles adhering to it. On account of these apparent merits, it is usually sold at an advance on the price of the regular article. All of this so called refined beeswax, so far met with, had been moulded into the shape of oblong blocks of uniform size, measuring about fourteen inches in length, eight in width and three in thickness, tapering slightly upwards, and weighing about eight pounds on an average.

The melting point of the refined wax was found to be 146° F., that of pure wax being 156° , and that of paraffin from 137° to 140° . Its specific gravity is .929, placing it again intermediate between beeswax .963, and paraffin .871. Being thus induced to suspect the presence of the latter body, 100 grains of the refined article were heated for fifteen or twenty minutes with one ounce of sulphuric acid to about 350° F., several ounces of water were then added, and after cooling, a sheet of paraffin weighing 80 grains was obtained; the loss representing the beeswax which had been carbonized by the acid. In order to verify the experiment, it was repeated with a composition of four parts paraffin to one of wax, when analogous results were obtained. 100 grains of pure paraffin, treated in the same manner, were recovered unchanged.

All the best text books recommend fuming Nordhausen acid for this purpose, and state that an allowance must be made for a portion of paraffin charred by this acid. No one seems to have previously tried the ordinary commercial sulphuric acid, which was really found to be better adapted than the Nordhausen, as all the wax was carbonized and none of the paraffin affected.

The test is very readily applied, the only difficulty, and this a very trivial one, being the separation of the carbonaceous matter from the paraffin. It is most conveniently moved by repeatedly melting the paraffin on water, at the same time gently stirring it, so that the black particles can subside.

There seems to be a considerable difference in the mode of con-

traction, while cooling, between beeswax and paraffin, and this may serve to detect the adulteration, at least when practised to this extent. Blocks of paraffin are decidedly concave on the top, and specimens of adulterated wax will be observed to be more or less concave on the top in proportion to the amount of paraffin which they contain. Pure beeswax appears to be level, the contraction acting in a horizontal direction, and tending rather to the production of vertical fissures.

The optical behaviour is also different; pure wax is quite opaque, while this adulterated article is somewhat translucent, more particularly on the edges.

On a Drug substituted for Chiretta. Prof. Bentley. (*Pharm. Journ.*, 3rd series, v., 481.) The author reports on a sample of suspected *chiretta* forwarded to him by a London firm. In colour and general appearance the sample closely resembled the officinal *chiretta*, but a careful examination revealed several marked distinctive characters, the most important of which are given in a tabulated form along with the characters of the true *chiretta*.

SPURIOUS CHIRETTA.

Stem obscurely quadrangular below, its four angles being each marked by a somewhat prominent border or wing; and very evidently quadrangular and winged above.

Leaves when present, sessile, narrow, and tapering to each end, that is somewhat lanceolate in outline.

Scars left by the fallen leaves, not very prominently marked, in consequence of the slight and comparatively narrow attachment of the leaves.

Flowers arranged in elongated loosely aggregated clusters, or cymose panicles. Flowers also larger and longer than those of true *chiretta*.

TRUE CHIRETTA.

Stem round below and throughout nearly its whole length; and very faintly quadrangular above.

Leaves embracing the stem, broad at their base, and tapering upwards into a long acute point; that is ovate or cordate-ovate in shape, and acuminate-pointed.

Scars left by the fallen leaves, very evident, opposite to each other and almost encircling the stem.

Flowers arranged in less elongated cymose panicles, that is, more compact, and more umbellate.

A transverse section of the stem exhibits a comparatively thick woody ring on the outside; and with the centre hollow, or presenting but faint traces of pith attached to the inner surface of the ring of wood.

A transverse section of the stem exhibits a comparatively thin woody ring, enclosing a large continuous easily separable pith, which is yellowish in colour.

The infusions of the two drugs also afford a marked difference. The taste of the infusion of true *chiretta* is intensely bitter; and that of the spurious drug, although bitter, far less intensely so than that of the official drug. An infusion of true *chiretta* has also a somewhat greenish tint, while that of the spurious drug has a distinctly yellowish brown colour.

The question of the botanical source of the spurious drug now arises. It is well known that in the Indian bazaars several plants are known by the name of *chiretta*, besides the true drug, and are used for the same purposes as it. Thus, Royle, many years since, in his *Illustrations of the Botany of the Himalayan Mountains*, page 277, stated that *Ophelia angustifolia*, Don., is so used in Northern India, where it is called *puharee* (hill) *chiretta*, to distinguish it from the true or *dukhune* (southern) *chiretta*; and he adds that *Exacum tetragonum* is also called *ooda* (that is, purple) *chiretta*.

At least three other species of *Ophelia*, namely, *O. elegans*, Wight., *O. densifolia*, Grisebach, and *O. multiflora*, Dalzell, and two other species of *Exacum*, *E. bicolor*, Roxb., and *E. pedunculatum*, Linn., may be also enumerated; as well as *Slevogtia orientalis*, Grisebach, which is known as *chota chiretta* (small *chiretta*), as being employed in India like true *chiretta*.

The above-mentioned plants are all derived from the same natural order, Gentianaceæ, as that yielding the true *chiretta*; but besides these, as mentioned by Royle, Waring, and other writers, another powerful Indian bitter—that is, *creyat* or *kariyât*, derived from *Andrographis* (*Justicia*) *paniculata*, Wall., of the natural order Acanthaceæ, is also often confounded in Southern India with the true *chiretta*.

Considering the number of substitutes for the true *chiretta* which are known in India, it is surprising that some of them should not have found their way accidentally or intentionally into the European markets; but beyond the case of false packing, described by Mr. E. A. Webb (*Pharm. Journ.*, 3rd series, i., 367), in which the roots of *Rubia cordifolia*, Linn., had been enclosed in bundles of

chiretta, the author knows of no case of adulteration or substitution of true chiretta published in this country.

The botanical source of the present substitute for chiretta is therefore one of some interest and importance, and upon examination, Professor Bentley believes it to be the sort of chiretta which, as stated above, is called in India *puharee* (hill) *chiretta*, and which is derived from *Ophelia angustifolia*, Don.; or if not from this plant, most certainly from a species of *Ophelia* very closely resembling it. Thus it may be derived from *Ophelia pulchella*, Don. It is therefore closely allied to the true and official chiretta, which is obtained from *Ophelia chirata*, Grisebach, and it possesses in some degree the bitter tonic properties of that drug. It is satisfactory to know that such is the case, and that, therefore, its use can lead to no serious consequences; but as it is very inferior in its bitter tonic properties to the genuine drug, it ought not to be substituted for it.

Oreodaphne Californica, Nees., Nat. Ord. Lauraceæ. John P. Heamy. (*Amer. Journ. Pharm.*, v., 105.) *Botanical Description*.—Flowers hermaphrodite; perianth short, campanulate, and deeply six-cleft. The divisions are somewhat rigid, equal, and deciduous. Twelve stamens, of which the exterior nine are fertile, and the three interior are sterile. The sterile stamens are shaped differently from the fertile. The stigma is peltate and shortly lobed. The flowers are in axillary umbels, surrounded by an involucre, which falls off during the development of the flowers. The fruit is a one-seeded fleshy berry or drupe. The leaves are alternate, simple, lanceolate, slightly acuminate, petiolate, exstipulate, pinnately veined, coriaceous, and marked with minute pellucid dots. The margin is entire, and the upper surface reticulated.

The *Oreodaphne Californica*, more familiarly known by the name of "California bay laurel," is an evergreen tree indigenous to California and the Pacific slope. It acquires considerable size and age, and grows abundantly throughout the state, particularly in the vicinity of ravines and moist shady localities. It flowers in June. The wood is much valued for ornamental cabinet-work, on account of its grain, which, when polished, presents a fine appearance. The tree is never attacked by insects, owing, as it is supposed, to the volatile oil it contains. Some of the native Californians have peculiar ideas concerning this tree. It is believed by them to aggravate asthmatic complaints, and that sleeping in the vicinity of the tree will even produce asthma. That it is not without some action on the system has been proved by the inhalation of its odour often producing dizziness and violent headache.

All parts of the tree contain volatile oil, but the leaves yield the most, about four per cent. being obtained by distillation. The oil is of a straw colour, limpid, and has a pungent aromatic odour, resembling a mixture of nutmegs and cardamoms. Its taste is warm and camphorous. It burns with a bright, smoky flame, leaving a carbonaceous residue. Its specific gravity is .936. It is soluble in about 1000 parts of water, and mixes in all proportions with alcohol and ether. The oil, when inhaled, produces dizziness and headache, and is therefore deemed to have a marked action on the nervous system. Dr. Silver recommends the smelling of the oil in nasal catarrh and nervous headache, and speaks of successful results.

Oils from the Berries of Benzoin Odoriferum, Nees. P. M. Gleim. (Abstract of an inaugural essay; *Amer. Journ. Pharm.*, 4th series, v., 246.) The author obtained from sixteen troy ounces of the berries, dried and reduced to coarse powder, by exhausting with petroleum benzin, seven troy ounces of an oily liquid of a beautiful deep red colour, very aromatic in taste, and highly odorous. It is soluble in bisulphide of carbon, ether, and chloroform, and partly soluble in alcohol, glycerin, and turpentine. Its sp. gr. is .925. It was used in several cases in liniments, acting as a good stimulant, and it even appears to be applicable for lubricating purposes.

By distilling eight troy ounces of the fresh berries with water, four fluid drams of a colourless volatile oil was obtained, having the sp. gr. .87, and a very fragrant odour, resembling somewhat that of jessamine. The author suggests that it could doubtless be used with advantage in perfumery.

The relative Therapeutic Values of the different Kinds of Sarsaparilla. E. Marquis. (*Archiv der Pharmacie*, April, 1875, 331-322; *Amer. Journ. Pharm.*, 4th series, v., 264.) In a long essay on this subject the author gives the details of an exhaustive investigation made for some years past, in the Pharmaceutical Institute of the University of Dorpat, Russia, under the supervision of Prof. Dragendorff. The following is a brief abstract of this interesting paper.

The air-dry substance, in coarse powder, was dried at 110° C. (230° F.); the loss indicated the moisture. The powdered root was exhausted by digestion with alcohol of 30 per cent., and the resulting dry extract weighed. The extract was exhausted with cold distilled water, and its sugar determined in the filtrate; the residue was exhausted with boiling alcohol, which left a minute flocculent residue

of a brown colour. After the evaporation of the alcohol and drying, the brownish yellow mass was weighed as smilacin. The residuary root powder from the previous experiment was exhausted with cold distilled water, and the resulting dry extract weighed. This extract was again dissolved in water, and the solution mixed with five times its volume of alcohol; the precipitate, after drying, was weighed as mucilage; it was found to contain but a trace of albumen. The mucilage was incinerated and the ash weighed. The starch was estimated by Fehling's solution, after converting it into glucose by continued boiling with diluted sulphuric acid. The total percentage of ash was determined by incinerating fresh portions of the root. The following table gives the results obtained for 100 parts of the air-dry roots:—

SARSAPARILLA.	Moisture.	Alcoholic extract.	Smilacin.	Alco. ext. soluble in water.	Aqueous extract.	Mucilage.	Ash of mucilage.	Aq. ext. sol. in alc.	Starch.	Sugar.	Ash of Root.
Honduras, 1874 . . .	10.39	5.5	0.45	4.96	2.6	2.04	lost.	0.56	45.0	none.	4.4
" " " " " " " "	10.3	5.44	0.58	4.86	2.56	2.1	0.42	0.46	45.0	"	4.87
" " " " " " " "	10.32	13.38	1.26	12.12	6.98	4.26	0.4	2.27	6.25	"	6.15
Caracas, 1868 . . .	11.33	9.62	1.5	8.12	3.1	2.5	lost.	0.60	23.68	"	4.23
" " " " " " " "	11.2	9.42	1.6	7.82	3.18	2.5	0.2	0.68	23.68	trace.	4.2
Italian, 1865 . . .	11.12	8.43	0.86	7.57	3.36	2.7	0.16	0.66	20.27	none.	4.10
Lisbon (Rio Negro), old	11.62	9.16	0.86	8.30	4.81	4.3	lost.	0.51	20.49	"	6.46
" " " " " " " "	10.97	8.66	0.86	7.80	5.00	3.46	1.14	1.54	14.34	"	4.35
Jamaica, 1865 . . .	11.16	12.34	1.68	11.66	9.74	8.5	lost	1.24	4.39	"	8.15
" " " " " " " "	11.19	12.22	1.78	10.44	9.82	8.44	1.38	1.38	4.39	"	8.21
Vera Cruz, without rhizome, 1874 . . .	10.7	9.2	1.42	7.78	7.5	3.08	0.48	4.42	6.92	trace.	6.80
Vera Cruz, without rhizome, unwashed, 1865	9.8	14.8	1.5	13.3	7.1	4.06	0.38	3.04	6.92	none.	12.4
Vera Cruz, rhizome, old	8.11	7.84	1.24	6.60	3.2	1.82	0.24	1.38	3.1	"	3.26
" " " " " " " "	9.8	9.22	1.48	7.74	10.1	8.38	0.52	1.72	9.37	"	6.88
Smilax aspera . . .	9.1	13.98	5.12	8.86	3.92	2.14	0.6	1.78	15.0	trace.	4.3
" " China . . .	12.53	3.54	0.68	2.86	3.3	2.28	0.1	1.02	30.0	none.	1.59

Thirty years ago the percentage of smilacin had been determined as follows:—

	Vera Cruz.	Lima.	Caracas.	Lisbon.	Honduras.	Jamaica.
By Adrian . . .	1.688	1.458	1.292	1.125	1.083	1.042
By Ingenohl . . .	1.880	—	—	1.410	1.100	—

Since the virtues of sarsaparilla are most probably due to smilacin, it would appear that the Vera Cruz and Jamaica varieties are the best for medicinal purposes.

Coriandri Fructus, Microscopical Characters of. H. Poeklington.

(*Pharm. Journ.*, 3rd series, v., 302.) We may here neglect the structure of the chaff or husk-like seedvessel, and confine ourselves to the structure of the *mericarps* within it. These are, of course, of the great umbelliferous type, but present strong points of individuality. We notice first on superficial examination, that each mericarp has *five* depressed ridges, which are more or less wavy, and *four* other ridges prominent and nearly straight. There are no *vittæ* except two small ones in each mericarp near the commissures. The outer integument of the seed consists of long, narrow, semi-ligneous fibres, disposed in a very irregular and interlaced manner. Within this is a loose layer of parenchymatous tissue, and within this the seed with its contents of oil and protein stuffs. These cells are of varied character. Near the exterior of the seeds they are compressed and angular. In the interior they are much larger, less angular, but still by no means spherical, and have well thickened walls, presenting a very definite outline.

The Uses of *Agave Americana*. J. R. Jackson, A.L.S. (*Pharm. Journ.*, 3rd series, v., 461.) Some attention has lately been drawn to the common agave (*Agave Americana*) on account of its supposed efficacy as an antiscorbutic. General Sheridan is said to have used the juice with great success amongst his men, who were suffering from scurvy, in a small isolated post on the Texas border. The disagreeable smell of the juice, which has been compared to that of putrid meat, causes a person at first to turn from it in disgust; but after a while the odour is overcome, and a liking for it takes the place of the previous dislike. To the compulsory doses of this juice taken by Sheridan's small army, the effectual stay of scurvy is attributed. In Mexico the plant is very highly valued for its medicinal properties, the belief in which amongst the Mexican peasants has been handed down from a remote period of history. Thus, the gum found in the lower part of the stem is used as a cure for toothache, whilst the juice of the leaf is applied to bruises and contusions. This juice forms a large article of internal trade in Mexico. The plant is known as the *maquey*, or "tree of wonders," and even at the present time, in some parts of Mexico, it is considered one of the most important productions of the soil. The use of the juice of the plant as an intoxicating beverage, is said by some to date back to the days of the early inhabitants of the Mexican continent. The author gives an interesting account of the history of this plant, for the details of which we must refer our readers to the *Pharmaceutical Journal*.

Several varieties of the plant are cultivated in Mexico, each being

known for the greater or lesser quantity of the juice it produces, its colour, whether yellow or greenish, its thickness, or sweet or bitter taste. These variations as to the properties or consistency of the juice depend a great deal upon the nature of the soil, and of the range of temperature; thus, it is the least mucilaginous in a somewhat clayey soil, and is cultivated with the greatest success at an elevation of about 9000 feet. Though the plant is cultivated very largely in many parts of Mexico, it is in the plains of Apam that the greatest agave district is situated; more than 600 square leagues are here almost covered with the plant, either in its wild or cultivated state. The mode of propagation is by removing the young plants or suckers from the old ones, and after spreading them on the ground for two or three months to partially dry them, so that they may not rot instead of starting into growth, they are planted in rows, and barley sown between them, which is considered rather to assist their growth. In a good soil, the agave plant requires a period of from ten to twelve years before attaining maturity. "The plant upon attaining its full growth, which is easily discernible by its height and the prodigious extension of its leaves, brings forth a tall stem crowned with yellow flowers; and then a certain amount of pruning becomes necessary, so as to form a kind of reservoir in the centre, and what is technically termed a *cara*, or 'face,' around it, so as to cause the juice to flow towards the same spot, and to facilitate the extraction of it by removing some of the interior leaves and thorns."

To collect the juice, or *pulque*, as it is called, as soon as the leaves begin to turn yellow, a small concave aperture is scooped in the core of the plant, and an elongated tube-like gourd, the air in which is exhausted by suction, is thrust into the aperture; each labourer carries with him, strapped to his back, an impervious sheepskin bag, into which the gourd tube is emptied as soon as it is filled. From fifty to sixty plants are usually allotted to the care of one man, and from these he extracts on an average, about 110 to 120 arrobas of juice, called honey-water, per week. After each plant has been exhausted of its juice—and often two collections are made in one day—the apertures or incisions are carefully covered up with leaves and stones to preserve them from the attacks of cattle, dogs, and a kind of jackal common in the country. The pulque manufactories on the plantations to which the juice is removed after collecting, consist of long, covered, and well ventilated galleries, in which are rows of vats made of bullocks' hides stretched over a framework, and covered with lime. The juice is emptied into

these vats, and allowed to stand for about thirty-six hours, when fermentation ensues, and its yellow transparent colour changes into a milky white. After fermentation, the juice or pulque is ready for use, and is then sent off to the city of Mexico, Puebla, or the nearest market within a radius of twenty or thirty leagues; the pulque very commonly undergoing a considerable dilution of water by the way, at the hands of the carriers, who convey it in sheep-skin bags upon mules or donkeys. The quantity of it which thus annually enters the city of Mexico alone may be estimated on an average to be about 2,000,000 arrobas, and that which enters Puebla to be about 500,000 arrobas; and the cost of transport alone has been calculated, taking the approximate average of one real as that of each arroba, to represent the sum of 312,000 dollars; not less than 20,000 mules and donkeys laden with the beverage entering the city every month by the gate leading to the maguery districts. To the quantity paying duty must also be added a considerable quantity which is smuggled in, and including this it may be calculated that about 50,000,000 bottles are now annually introduced into the city of Mexico.

"From a chemical analysis of pulque it is found to contain, in different proportions, according to its quality, alcohol, mucilaginous fecula, sugar, water, and potash. It has been observed that the drunkenness produced by it is of a less violent description than that produced by another common beverage of the country, *chinguirito* (brandy made from the sugar cane), and that *delirium tremens* is rarely produced by the immoderate use of the former, though often by that of the latter. It is also affirmed that the pulque drinker is commonly long-lived, whilst the reverse is the case with regard to persons addicted to *chinguirito*, and that the former beverage, notwithstanding its somewhat acid taste, is, probably on account of the fecula contained in it, peculiarly beneficial to women suckling their infants, and to those people whose constitutions require a wholesome stimulant."

Besides this pulque which, as we have seen, is the chief product of the *Agave* in Mexico, a strong spirit is prepared from the sap, known as *mezcal*, also a kind of brandy of 80 degrees of strength, a sweet thick substance resembling honey, a concentrated gum used in medicine, brown sugar, loaf sugar, sugar candy, and vinegar of very excellent quality; so that the *Agave*, the value of which to us is mostly for its fibre, is, in fact, one of the most important economic plants of Mexico.

On the Occurrence of Arbutin in Ericaceous Plants. J. M.

Maisch. (*Amer. Journ. Pharm.*, 4th series, iv., 314.) Arbutin was discovered in 1851, in the leaves of *Uva ursi* by Kawalier, and recognized as a glucoside, splitting into sugar and arctevin. The latter body was further investigated by A. Streeker, and in 1853 announced to be identical with hydrokinone, the nitro-compounds of which were more fully described by him in 1861. In 1859, Uloth found in the dry distillate of the extract of several ericaceous plants (*Chimaphila umbellata*, *Calluna vulgaris*, *Sedum palustre*, and *Vaccinium myrtillus*), besides pyrocatechin, a neutral crystallizable principle, which he named ericinon, and which Hesse believed to be identical with hydrokinone. This identity was subsequently (1864) proved by Zwenger and Himmelmann, who separated arbutin from the leaves of *Chimaphila umbellata*, and found that this principle yields, on dry distillation, hydrokinone, but no pyrocatechin, while among the products of the dry distillation of kinic acid they observed pyrocatechin, besides hydrokinone, as announced by Woehler in 1844. The hydrokinone which is found in the dry distillate of ericaceous leaves is therefore ascribed by them to the presence therein of arbutin, while that in the leaves of *Vacciniæ* is due to kinic acid, the presence of which has been proved by Zwenger in the leaves of *Vaccinium myrtillus*. In 1870, E. Claassen announced having obtained a crystalline principle from the leaves of *Vaccinium vitis idæa*, which the author at one time supposed to be probably identical with arbutin; however, on comparing his process with Zwenger's process for kinic acid, the two will be found identical, except that Claassen has omitted the final treatment with sulphuric acid, thus rendering it probable that his vacciniin is simply kinate of calcium. This supposition is confirmed by comparing the properties of this so-called vacciniin with those of kinate of calcium; the main difference will be found to be that the latter is stated to be nearly tasteless, while vacciniin is of a somewhat bitter taste (kinate of potassium is decidedly bitter); moreover, the absence of lime in vacciniin has not been proved by Claassen, for he merely says that his crystals are reduced to coal by a stronger heat.

This position appears to be further strengthened by the results of an analysis of the leaves of *Gaylussacia resinosa*, Torrey and Gray (s. *Vaccinium resinosum*, Lin.), undertaken at my suggestion by Mr. Hugo Oppermann, and reported in his inaugural essay, recently presented to the Philadelphia College of Pharmacy. Arbutin could not be obtained by any process, nor could its presence be detected by Jungmann's phosphomolybdic acid test; but the liquid from which colouring matter had been removed by acetate of lead and

sulphuretted hydrogen, and which still contained calcium, had a bitter taste. The preparation of kinic acid was not attempted. The leaves of the American *Vacciniæ* deserve further investigation in the direction indicated above, since some at least yield hydrokinone on the dry distillation of their extract.

While it seems probable, from the foregoing, that plants of the sub-order *Vacciniæ* contain kinic acid instead of arbutin, the latter principle appears to be widely distributed among the plants belonging to the sub-orders *Ericinæ* and *Pyroleæ*. Besides those mentioned above, it has been obtained by Mr. Jefferson Oxley from *Epigœa repens*, Lin., and *Gaultheria procumbens*, Lin., and by Mr. J. H. Flint in *Arctostaphylos glauca*, Lindley. To these must now be added *Chimaphila maculata*, Pursh, from which Mr. Bartholomew Bantly obtained it in handsome crystals.

Most of these plants have been employed in medicine in diseases of the urinary organs, diuretic properties being ascribed to them. Prof. C. D. Schroff observed no diuretic effects from half a gram of pure arbutin, while E. C. Hughes states his ursin (which J. Jungmann has since proved to be arbutin contaminated with gallic acid) to possess diuretic properties. It is not impossible that tannin or gallic acid is necessary to induce the diuretic action of arbutin. The investigation of the leaves of other plants belonging to the natural order *Ericaceæ* appears desirable.

Arbutin in *Kalmia latifolia*, Lin. G. W. Kennedy. (*Amer. Journ. Pharm.*, 4th series, v., 5.) In order to determine the principles in hitherto unexamined genera of the order *Ericaceæ*, the writer has made an examination of *Kalmia latifolia*, in the course of which he succeeded in isolating arbutin.

The genus takes its name in honour of Peter Kalm, a distinguished Swedish botanist. The species, *latifolia*, or broad-leaved *Kalmia*, is known by the names of calico bush, mountain laurel, and spoonwood, the latter name being given because the Indians made spoons from the wood. It is an evergreen, and is found abundantly from Maine to Ohio and Kentucky, growing on hillsides and mountains, preferring damp soil; the leaves are mostly alternate, bright green on both sides, ovate-lanceolate or elliptical, tapering to each end, and tenacious. It grows from four to twenty feet high, its growth being influenced by the locality. On level grounds and small hills it is scarcely ever found above ten feet high, whereas in mountainous regions it grows as high as twenty feet, presenting a tree-like appearance. Where the writer resides it grows from six to twenty feet, and is scarcely ever found smaller than six.

The process adopted for the extraction of arbutin was that of Kawalier, and was conducted in the following manner. Three pounds of the fresh leaves were collected by the writer, and carefully dried in a room, when they were found, upon reweighing, to have lost 63 per cent. The dried leaves were coarsely powdered, and treated with boiling water for several hours, strained, and expressed, and again treated in a similar manner. The mixed decoctions were precipitated with acetate of lead, and filtered; the filtrate was then submitted to the action of sulphuretted hydrogen to remove all the lead; the liquid is again filtered, and evaporated to the consistence of a soft extract. The evaporation in the first experiment was carried too far, leaving a viscid reddish coloured mass, in which, after standing several days, no crystals of arbutin were perceptible. Another lot of the leaves was gathered, a strong infusion was made, filtered, and evaporated to a solid consistence. The aqueous extract thus obtained was treated with alcohol; the residue was a viscid mass containing the kinic acid, if present, perhaps in combination with calcium, this being insoluble in alcohol. An aqueous solution of this substance was next formed, and allowed to evaporate at a gentle heat, when crystals of the kinate, if present, should have been deposited; but, as in the preceding examination, the author was disappointed. Another experiment was made similar to the first, with the exception that the liquid, after being treated with acetate of lead and sulphuretted hydrogen, was not evaporated so much, and the author was this time rewarded with the separation of arbutin in crystals, repeated experiments giving the same satisfactory results. A few crystals were separated from the mass to which they were adhering and dissolved in water. The solution was made alkaline by ammonia, as directed by Jungmann, and phosphomolybdic acid added, when immediately the beautiful blue colour characteristic of arbutin was produced. Quite a weak infusion of *Uva ursi* was at the same time made and tested as above, which gave the same blue colour. If an impure solution is examined, which with ammonia will make an orange colour, the phosphomolybdic acid added to this will change it to a bluish green. *Kalmia latifolia* does not contain arbutin so largely as *Uva ursi*. The process of Kawalier is certainly a good and simple one, but subacetate of lead may be advantageously substituted for the acetate, to separate gum and colouring principles, the presence of which will retard the crystallization of the arbutin.

Besides arbutin, the presence of gum, tannin, calcium, and iron was noticed incidentally.

The Insecticidal Properties of some Species of *Pyrethrum*. Hermann Kalbruner. (*Zeitschrift des allgemeinen österreichischen Apothekervereines*, vol. xii., p. 542; *Pharm. Journ.*, 3rd series, v., 503.) Some plants of the Composite family have long been used for the destruction of different kinds of insects. Thus, Mathiolus in his "Herbal" (A.D. 1563) says of the *Conyza media* (*Conyza squarrosa*, L.) that the smoke of it will drive away fleas, gnats, and other noxious insects. The smell of *Inula pulicaria* was held to be equally efficacious in dispersing insects, and the herb *Artemisia Absinthium* was used for similar purposes. In the Banat the root of *Inula Helenium*, L., has long been held in high esteem as a fumigant against mosquitoes, etc.

But in more recent times certain species of *Pyrethrum* have obtained considerable reputation as insecticides; the *Pyrethrum carneum* and *P. roseum*, M.B., both growing wild, and frequently cultivated in the Caucasus, having in this respect proved to be very superior. In the year 1846, Zacherl, a Tiflis merchant, first introduced the sale of these flowers into Vienna under the name of "Persian insect powder."

Notwithstanding that *P. carneum* and *P. roseum* are indigenous in the Caucasus and in Persia, they have been successfully cultivated in many localities in Europe and North America. The climate of Lower Austria suits them very well. They are found there as ornamental plants in the gardens, and they grow in northerly cool places with especial luxuriance. The author has had plants of *P. roseum* in his garden during several years, and they have supported the cold of winter without shelter.

Under the name of Dalmatian insect powder, the flowers of *Pyrethrum cinerariæfolium*, Trev., a plant that grows wild in Dalmatia, have been used. Through the kindness of a friend, the author obtained some seeds from Dalmatia, from which he was successful in raising plants in his garden, where they lived through the winter in the open air.

In order to test the effect of the different insect powders, the author sprinkled some flies with the powders, and took the length of time required to kill the flies as the measure of the value of the powders. When a house fly was placed in a small flask, sprinkled with four grains of insect powder, if the powder were very powerful there was considerable stupor at the end of one minute, followed by death of the fly after two or three minutes. The commercial insect powders behaved differently in this respect, some of them corresponding completely to the above standard, whilst others, al-

though they quickly stupefied flies treated as above, required fifteen to thirty minutes to kill them. The druggists in Vienna purchase the whole flowers, yielded, in the author's opinion, by the uncultivated Dalmatian *Pyrethrum cinerariæfolium*, Trev., and the powder they supply is a very energetic preparation. It is noteworthy that both these entire flowers and the powder prepared from them, after being kept six years, do not suffer any particular loss of activity. The author found the powder of the flowers of *P. cinerariæfolium* cultivated by himself also to be very active.

Pyrethrum roseum, M. B., of the author's cultivation, appeared to be slower in its action, which he ascribes to the circumstance that the single flowers are much more powerful than the double flowers, which appear to have little activity. The double flowers occur in *P. roseum* in much larger proportion than in *P. cinerariæfolium*, and to this fact he considers the greater activity of the latter due.

The fresh (undried) flowers of both these *Pyrethrums* will kill flies, but very slowly. The plant itself, powdered, appeared to be quite inactive. In a similar manner the author tested the powdered flowers of several Austrian Compositæ, and he found the following to be quite inactive in this respect:—*Chrysanthemum leucanthemum*, L.; *C. coronarium*, L.; *Anthemis arvensis*, L.; *A. Cotula*, L.; *A. tinctoria*, L.; *A. nobilis*, L., and *Inula pulicaria*, L. The flowers of *Tanacetum vulgare*, L., and *Pyrethrum corymbosum*, Sm., appeared to have a very slight stupefying effect.

Of all the Austrian indigenous Composites tried by the author, only the powdered flowers of *Pyrethrum Parthenium*, Sm., and *P. inodorum*, Sm., exercised a stupefying influence upon flies, and that only after the flies had been dusted from one to two hours; their value, therefore, as insecticides, is very slight. In a scientific aspect it is, however, interesting to notice that up to the present time the action obnoxious to insects has only been observed in the genus *Pyrethrum*, whilst from other Composites approaching very nearly to that genus the property is absent.

Some years since, the *Journal de Pharmacie d'Anvers* contained an article which was copied into various other journals, asserting that the insecticidal action of Persian insect powder was due to powdered flowers of *Anthemis Cotula*. As above stated, the author found the flowers of this species quite inactive, since flies which had been dusted with it were after four hours still able to fly away readily. The author conjectures that a species of *Pyrethrum* was mistaken for *A. Cotula*.

The cultivation of *Pyrethrum roseum* and *P. carneum* has already

been attempted in various places in Austria. Paukert, an apothecary at Trenenbritzen, has cultivated them for several years, and in Hager's *Pharm. Centralhalle* (vol. vii., p. 49) has detailed his method of proceeding, from which it appears that the growth of the plants has been very successful in richly manured soil. The author's experiment also with *P. cinerariaefolium* yielded the flowers at a slight profit. But as very active flowers can be obtained from Eastern Asia and Dalmatia at a moderate price, he does not think that the home cultivation would be remunerative.

Carnauba Root. Dr. C. Symes. (*Pharm. Journ.*, 3rd series, v., 661.) Two bales of this root have been imported into Liverpool, with the following remarks in Portuguese:—

“This root is recognized by the profession as an excellent purifying agent, and has been successfully applied in the cure of various diseases arising from impurity of the blood. We are, indeed, astonished that it is not more widely known, as its therapeutic qualities, which are worthy of full credence, rival those of sarsaparilla. The carnauba root likewise has a diuretic power, and possesses unusual efficacy in the cure of acute or chronic blennorrhœas. It is, furthermore, very cooling, and displays a vigorous action in purifying the blood.”

The root is that of *Corypha cerifera*, a wax-bearing palm, growing on the shores of the Rio Francesco, in the Brazils. It is several feet in length, and has an average thickness of three eighths of an inch, of a mixed greyish and reddish brown colour, giving off here and there small rootlets.

The cortical portion is comparatively thick, somewhat friable, and loosely surrounds the medullium which encloses the pith; thus a transverse section somewhat resembles in appearance an exogenous stem. Its infusion is similar in colour to that of wild cherry bark, possesses an agreeable, slightly bitter taste, and an odour not unlike that of sarsaparilla; its colour is slightly deepened, but no precipitate occurs on the addition of liq. potassæ, neither on the addition of dilute acids. Tinct. ferri perchlor. does not strike a black, but brownish colour, gradually followed by turbidity and the formation of a brown deposit. The decoction is not affected by iodine, indicating the absence of starch; a drop of it concentrated on a porcelain slab, and treated with strong sulphuric acid, produces an olive green, slowly changing to a brown colour. It yields 25 per cent. of a reddish brown extract, possessing a decidedly bitter taste.

Helianthemum Corymbosum, Michaux. F. J. Kruell. (Condensed from an inaugural essay; *Amer. Journ. Pharm.*, 4th series,

viii., 357.) This plant is said to possess the same medicinal properties as the officinal *Helianthemum Canadense*. For the following analysis the herb was collected in the latter part of June, in New Jersey, and after carefully drying it in the shade, it was found to have lost 52·5 per cent.

An infusion, made with boiling water, was of a reddish brown colour, and a slightly bitter but very astringent taste, and possessed a grass-like odour.

The infusion was free from starch; alcohol produced a precipitate, consisting mainly of gum; and iron salts indicated the presence of much tannin. The latter was removed by gelatin, and the filtrate treated with subacetate of lead. The filtrate from this precipitate, after the removal of the excess of lead by sulphuretted hydrogen, contained but a minute quantity of colouring matter, which was found to be insoluble in alcohol and ether.

Three tinctures were next prepared with ether, alcohol, and with diluted alcohol. Evaporated to the consistency of a solid extract, the diluted alcohol tincture yielded 28 per cent., the alcoholic 16·4 per cent., and the ethereal 4·6 per cent. of the original weight of the herb employed; the portions of the herb extracted with alcohol and ether were dried, and exhausted with cold water, which, upon evaporation, yielded extracts weighing respectively 19·6 and 22 per cent. of the original weight, and containing glucose, as indicated by Trommer's test.

The extract obtained with diluted alcohol was of a dark brown colour, and a bitter and astringent taste. It was exhausted with diluted muriatic acid, the tannin removed, and then treated with carbonate of sodium, which darkened the colour without producing a precipitate, evaporated to an extract and treated with alcohol, which dissolved a little colouring matter, but no alkaloid.

The residue left by the dilute acid was digested in hot alcohol, and the solution filtered; this was of a dark brown colour, and a slightly bitter taste; when added to water it produced a milky solution, and, on further examination, was found to be resin and colouring matter.

The alcoholic tincture yielded an extract which was of a dark green colour, and a bitter and astringent taste; was but slightly soluble in water, ether, and chloroform, imparting merely a light green colour to the latter solutions. It consisted of resin, chlorophyl, bitter extractive, and colouring matter.

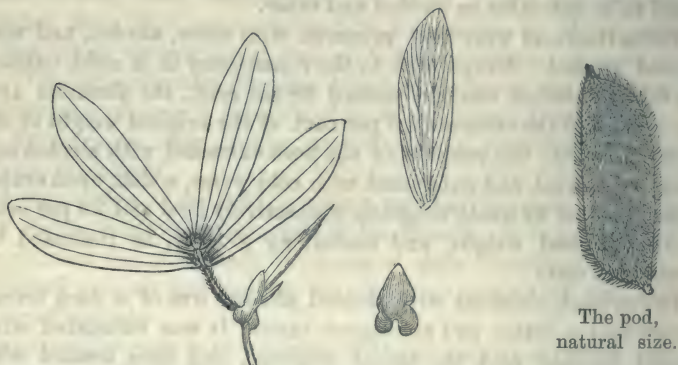
The extract obtained from the ethereal tincture was of a dark green colour, and of an agreeable aromatic odour, but of exceedingly

disagreeable taste, resembling somewhat that of coal oil. This extract was insoluble in water, but readily soluble in alcohol and bisulphide of carbon, and sparingly so in chloroform. It consisted mainly of chlorophyl, waxy matter, and an acrid resin. A portion of the herb was distilled with water, but no indications of a volatile oil were obtained.

From the foregoing experiments the author infers that the medicinal properties of frostwort are due to tannin and extractive matter.

The constituents of frostwort may be briefly summed up as follows:—*Tannin*, of which it contains a large percentage, resin, glucose, gum, extractive matter, chlorophyl, and inorganic salts.

Note on a Spurious Senna. E. M. Holmes. (*Pharm. Journ.*, 3rd series, v., 623.) In January, 1875, a drug was offered for sale in London, under the name of "fine senna," which differs considerably



The left-hand figure shows an entire leaf with a flower bud in the axil of the leaf. The right-hand upper figure shows the venation of a leaflet, and the small one below it represents a stipule.*

in botanical characters from the true article, although in size and colour resembling the Tinnevely variety. The author, in conjunction with Professor Oliver, identified it as belonging to *Cassia brevipes*, D.C., a native of Costa Rica and Panama.

The following is a description of the drug:—The twigs have hairy stems, and the leaves are alternate, compound, with a very short petiole, bijugate, and the rachis ends in an extremely fine short hair-like point. The leaflets, which are so closely placed as to overlap each other, are entire, unequal at the base, about $1\frac{1}{4}$ inch long, somewhat elliptic in outline, the lower margin being less curved than the upper; they are mucronate at the apex. The

* The woodcuts of this illustration and of that on p. 172 were kindly lent by the editor of the *Pharmaceutical Journal*.

most marked feature, however, consists in the venation. Three principal veins start from the base of the leaf, and, diverging but slightly, proceed nearly to the apex of the leaf. Each of these three veins is branched in a pinnate manner at a very acute angle (about 7°), so that at a casual glance the leaf appears furcate-veined. The two lower leaflets on each leaf are smaller than the two upper ones. The pods are brownish, about twice as long as broad, and covered with yellowish erect hairs. The stipules are lanceolate, with a cordate base, and have numerous minute veins. The flowers are large and yellow, with rigid scarious sepals, and are solitary in the axils of the leaves. An infusion made of this drug was very pale in colour, and proved to be devoid of purgative properties.

Goa Powder. Dr. J. F. Da Silva Lima. (*Medical Times and Gazette*, Mar. 6th, 1875.) Dr. Fayrer, of Calcutta, in a communication to the *Medical Times and Gazette* of October 24th, states in reference to the treatment of certain cutaneous diseases (herpes circinatus, chloasma, and intertrigo), that he has found no remedy so rapidly and so certainly effective as the solution in vinegar or lime juice of a secret preparation, which he believes to be of vegetable origin, sold in small phials by the chemists of Calcutta and Bombay, under the name of Goa powder. Dr. Fayrer speaks of another powder very similar to the former, and equally efficacious in the treatment of the same diseases, known as *po di Bahia*, a designation which the author believes may be of Malay derivation. Mr. D. S. Kemp, Dr. Fayrer adds, from the fact of orchilla (*Lichen orcella*) being imported in large quantities from the coast of Africa, north of Mozambique, into India, considers that substance as the probable source of the Goa powder. Mr. Hanbury, F.R.S., he says, on the contrary, alleges the Goa powder to be a secret remedy, whose composition and place of manufacture are alike unknown.

The author thinks he is in a position to furnish Dr. Fayrer and other medical men in India with such information as will lead to the establishment of the identity of the Goa powder and the *po di Bahia* with a popular remedy for many years employed in various provinces of the Brazilian empire for the cure of various cutaneous affections, and more especially of herpes circinatus, chloasma, and intertrigo. The remedy he speaks of is known in the province of Bahia under the name of araroba powder, and in the other provinces of the empire, importing it as they do from Bahia, under that of Bahia powder (*po' de Bahia*).

Araroba, or, as some call it, Arariba, is the name of a tree belonging to the *Leguminosae*, related perhaps to the tree of the same family furnishing the "Brazil wood" of commerce; several species

of the araroba, like Brazil wood, being employed as a dye. Araroba occurs in commerce, either in the form of a rough powder, or in small pieces of different sizes of a light yellow colour, becoming much darker on exposure to light and moisture. The part employed is said to be the medulla of the stem and branches. Reduced to a fine powder, it is in this country employed mixed with vinegar, just as the Goa powder and poh di Bahia in India, and produces exactly the same effects as, according to Dr. Fayrer, are produced by these,—irritating and discolouring the skin, and producing more or less heat in the part, according to the strength employed. In the same manner, the dark colour left by its application disappears after a few days, as Dr. Fayrer says occurs after the application of the Indian remedies.

The irritating effects of the araroba on the skin and mucous membranes, are such that the manipulation of it is attended with much inconvenience. The workmen employed in cutting up and pounding it are obliged to cover up their heads carefully in order to protect their face, eyes, mouth, nostrils, and throat, against its irritating effects.

The author states that the efficacy of araroba for the cure of certain cutaneous diseases is unquestionable; he himself had innumerable opportunities of verifying it in the case of the diseases cited by Dr. Fayrer, as also lately in a very obstinate case of mentagra that, having proved intractable to every variety of treatment, external and internal, yielded completely in a very short time to the application twice a day, by means of a camel-hair pencil, to the roots of the affected hairs, of a pomade of araroba, consisting of twenty grains of the araroba powder, ten drops of acetic acid, and an ounce of the unguentum benzoini. Long before reading Dr. Fayrer's paper, he had already suspected that the remedy used so advantageously in some parts of India for the treatment of herpes circinatus, and which was sold at a high price in the shops of Saigon and Singapore as the poh Baia, was none other than our araroba, more or less adulterated perhaps, with other colouring matters.

In 1872, during a conversation with Dr. Palasne de Champeaux, chief surgeon on board the French war steamer, *Sa Place*, he was informed that in Saigon, having on board many cases of herpes circinatus, intractable to the usually employed remedies, he (Dr. P. de C.) had been induced to try a native remedy, much vaunted in such cases under the name of poh Baia, procurable only in small quantities, and at an exorbitant price (two francs a gram). He had employed it as there recommended, mixed with vinegar, and

with marvellously good result. When told by Dr. da Silva Lima, in reply, that in Brazil the popular remedy for the cure of such cutaneous affections was the araroba powder, known in the other provinces of the empire as the *po' de Bahia*, mixed also with vinegar, the coincidence alike of the name, mode of application, and favourable results, struck both him and the writer as suggesting the identity of the two remedies. Dr. Champeaux on leaving for Europe received from the writer some of the araroba powder, which he afterwards employed with the same, only somewhat stronger, physiological and therapeutical effects, as he had seen follow the use of the *poh Baia*.

The author offers the following reflections, going far, as he thinks, to prove the identity of the araroba powder with the Goa powder, the *poh di Bahia* and the *poh Baia*.

1. For a good many years back, an old and well-known firm in this place has been in the habit of executing orders for large quantities of araroba for Portugal.

2. Araroba (at all events, under that name), so far as I am aware, is unknown alike to the chemists and the medical men of Portugal.

3. It is therefore highly probable that the araroba is from Portugal re-exported to its colonies on the coasts of Asia and Africa.

4. This probability will appear all the more striking when we learn from Dr. Fayrer, on the authority of Mr. Kemp, that from the north of Mozambique, a Portuguese settlement, there is exported for India a large quantity of *urzella* (*Lichen orcellis*); leading him to the inference of its being the chief constituent of the Goa powder.

5. Goa, importing araroba from Lisbon, would have given its own name to the product over the rest of India, just as Bahia has given it its name in other parts of the Brazilian empire.

6. Thus the terms Goa powder and *po' de Bahia* (the *poh di Bahia* of Dr. Fayrer, the *poh Baia* of Dr. Champeaux) would designate, all of them, the same original substance, more or less altered, it may be, by adulteration in India; the name *Poh di Bahia* coming from the name of the Brazilian province of which it is a native, and not, as Dr. Fayrer supposes, from any Malay origin.

7. Mr. Kemp's idea that the *urzella* is a chief constituent of the Goa powder may arise from the circumstance of their colouring, the one and the other alike, any object, such as the skin or clothes, brought in contact with them.

8. As the perfect similarity of the *modus operandi* of all three remedies would seem to point to their intrinsic identity, so would

their unvarying mode of application for therapeutical purposes appear to point to a common centre whence their use had sprung.

To corroborate still more the Brazilian origin of the remedy, Dr. Champeaux remarks in the May number of the *Archives de Médecine Navale* for 1873, that on questioning the person who supplied the hospital at Saigon with medicines, he, with much equivocation, confessed nevertheless, that the *poh Baia* was not indigenous, but came from America.

The best mode of applying the remedy is, as Dr. Silva Lima recommends, in the form of ointment,—twenty to forty grains of the pure araroba powder, with ten drops of acetic acid to an ounce of lard.

A Research on "Chrysarobine." (*Araroba Powder. Bahia Powder. Goa Powder.*) Prof. Attfield. (*Pharm. Journ.*, 3rd series, v., 721.)

1. The "chrysarobine" with which this research was made was a yellow powder containing some fragments of vegetable fibre. It was sent to the writer by Mr. David Kemp, F.C.S., Bombay.

On drying at 100° C., and then burning, it yielded:—

Moisture	1.17 per cent.
Combustible matter	98.40 "
Mineral matter (Ash)	0.43 "
<hr/>	
100.00	

2. The ash was composed mainly of silicate of aluminium and the sulphates of potassium and sodium.

3. During the combustion for ash much yellow vapours or fumes were noticed. They were readily condensed on any cold surface.

4. Some of the "chrysarobine" was placed on a watch-glass over the smallest gas-jets of an argand-burner, and another watch-glass inverted over the first. After twelve hours the powder had lost one tenth in weight, a very small quantity of sublimate occurring on the upper watch-glass. On raising the temperature, fumes were evolved, more sublimate obtained, and a charred residue remained.

5. Under the microscope the sublimate from the chrysarobine appeared moss-like rather than crystalline. Acids scarcely affected it; alkalies coloured it red.

6. Treatment of the chrysarobine with cold water yielded no satisfactory results.

7. Treatment of chrysarobine with hot water resulted in the ready removal of about 7 per cent. of matter; continued treatment

with hot water gave a very weak solution: suggesting the idea of the presence of some substance easily dissolved by hot water, and of a substance in much larger amount, and only slightly soluble in hot water.

8. The treatment with hot water was conducted in a retort with a condensing arrangement attached. The distillate was thoroughly examined, and the absence of any important amount of any kind of volatile matter in chrysarobine thereby proved.

9. The hot aqueous decoction of chrysarobine had a yellow colour and a bitter taste, was neutral to test-paper, scarcely affected by alcohol, gave no blue colour with iodine nor much red colour with potash, nor black with ferric chloride, though with ferrous sulphate and sulphuric acid it gave the black colour indicative of the presence of nitrates, and it readily reduced Fehling's copper solution.

10. Before examining the more important bulk of the chrysarobine, namely, the 90 per cent. of vegetable matter insoluble in water, the part soluble in hot water (about 7 per cent.) was subjected to investigation.

I. *Aqueous Extract of Chrysarobine.*

11. The chrysarobine was treated with hot water till the decoction ceased to taste bitter. This decoction was concentrated by evaporation. On cooling, some flocks separated which, when collected, slightly washed with cold water, and examined, gave reactions similar to those afforded by the substance which sublimed when the chrysarobine was heated. Here it may be stated that the prolonged treatment of chrysarobine with hot water (after the 7 per cent. readily soluble matter is extracted) brings out only small quantities of the substance resembling the sublimate just mentioned. Postponing the examination of the sublimate and the flocks, the investigation of the 7 per cent. of readily soluble matter of chrysarobine was continued.

12. The filtered decoction was therefore precipitated by solution of acetate of lead, the filtrate from this precipitate treated with solution of subacetate of lead, and the filtrate from the resulting precipitate treated with sulphuretted hydrogen to remove lead, and then concentrated. Examination was then made of (a) the lead-acetate precipitate, (b) the lead-subacetate precipitate, and (c) that portion of the chrysarobine decoction not affected by acetate or by subacetate of lead.

13. *The lead-acetate precipitate.*—It had a reddish colour. It was

washed with spirit of wine, and treated with acetic acid, in which it nearly all dissolved. What little remained undissolved was found to be sulphate of lead. The acetic solution of the precipitate was saturated with sulphuretted hydrogen to remove lead, the lead sulphide separated by filtration, and the filtrate examined for chlorides, phosphates, citrates, and tartrates. Neither was present. The remaining portion was then evaporated to dryness. The red glass-like or resin-like residue was soluble in spirit, also in alkaline solutions, which yielded a precipitate when neutralized by acids.

The aqueous solution of the red body was not, apparently, very stable when subjected to prolonged evaporation. This liquid did not reduce Fehling's copper solution until after ebullition with diluted sulphuric acid, when it reduced the copper liquid readily. Of the substances present in the aqueous decoction of chrysarobine, that precipitated by lead-acetate has most of the characters of a glucoside.

14. *The lead-subacetate precipitate.*—It had a yellowish colour. It was separated, washed, and dissolved in acetic acid. Here also a little sulphate of lead was met with, probably protected from the previous action of the lead-acetate by organic matter. The acetic solution contained neither chlorides, phosphates, tartrates, nor citrates. Evaporated to dryness, it afforded a residue nearly all soluble in alcohol. This constituent of chrysarobine, that is, the constituent readily removed by water, not precipitated by acetate of lead, but precipitated by subacetate of lead, is the bitter principle of chrysarobine. It is soluble in alcohol. Ether dissolved it in part. Both parts were bitter.

15. *The soluble constituent of chrysarobine decoction precipitable neither by lead-acetate nor lead-subacetate.*—After removal of the lead by sulphuretted hydrogen, the fluid was evaporated to a low bulk. A mass of acetates of potassium and sodium, with some nitrates, crystallized out, the source of the acetic constituent being, of course, the lead-acetates, while the nitrates and the alkali metals came from the chrysarobine. The non-crystalline portion reduced Fehling's copper solution, but was not sweet to the taste.

II. *Benzolic Extract of Chrysarobine.*

16. The 90 per cent. of chrysarobine, insoluble, or almost insoluble in water, was dried and treated with benzole. About 84 of the 90 per cent. dissolved. The solution was yellow when dilute, and a deep brown when strong. On cooling a yellow granular substance

separated in abundance. This substance gave all the reactions afforded by the sublimate of chrysarobine mentioned in sections 3 and 4. In alcohol it was less soluble than in benzol, still less in ether, and very slightly soluble in water. These solvents affected it more rapidly and powerfully when hot than when cold; and hot solutions deposited it on cooling. It was soluble in aqueous solution of potash, with formation of a deep red solution. Acids reprecipitated it from such alkaline solutions. If the alkaline solutions were exposed to air, some alterations went on, and the acids then gave a brown instead of a yellow precipitate. In an alcoholic solution of potash this alteration was not observed. The most minute trace of the substance gave the red coloration with potash. Heat affected it in the manner that heat affected the chrysarobine. On the addition of solution of alum to the potash solution, a copious light brown precipitate resulted. The substance dissolved slightly in solution of ammonia, and the resulting pink solution gave a pink precipitate on the addition of alum solution, and a lilac coloured precipitate on the addition of acetate of lead. Water added to the alcoholic solution of the substance caused partial precipitation. By recrystallization from benzol it was sometimes obtained in crystalline tufts.

17. The yellow substance (obtained on washing chrysarobine with hot water, drying it, treating the dried and now purified chrysarobine with boiling benzol, cooling the benzol, and then twice recrystallizing from alcohol the yellow substance deposited from the hot benzole) was burnt to ascertain its percentage of carbon, hydrogen, and (by difference) oxygen.

18. The same yellow body recrystallized from ether was also burnt.

19. The similar yellow substance obtained from the washed and dried chrysarobine by alcoholic potash (in an atmosphere of hydrogen to prevent oxidation), precipitation by dilute acid, and recrystallization from hot alcohol, was also burnt.

The three combustions yielded the following results:—

(17.) Yellow substance extracted by benzol and alcohol—

Carbon	75.98
Hydrogen	7.70
Oxygen	16.37
	<hr/>
	100.00

This substance crystallized several more times from alcohol was

thus purified from a resinous body (probably a hydrocarbon) and was again burnt.

(17a.) Yellow substance extracted by benzol and alcohol:—

Carbon	.	.	.	.	.	.	.	72.73
Hydrogen	.	.	.	.	.	.	.	5.23
Oxygen	.	.	.	.	.	.	.	22.04
								<hr/>
								100.00

(18 and 19.) These, corrected for moisture afterwards found to be present, yielded—

						(18)	(19)
Carbon	.	.	.	.	.	69.3	69.8
Hydrogen	.	.	.	.	.	4.6	4.8

20. The figures just given, and all the reactions already mentioned clearly indicate that the chief constituent of chrysarobine is CHRYSOPHANIC ACID.

21. Chrysophanic acid is so called from the Greek "gold-shining" or "yellow shining."

22. The word chrysarobine has doubtless been given in allusion to the yellow colour of this arobine or arariba. The name chrysarobine could scarcely have been more happily chosen had the facts of this research been known beforehand. Mr. Holmes, Curator of the Museum of the Pharmaceutical Society, says that there is in the Museum some crude arariba from Bahia which resembles chrysarobine, but contains fragments of wood, the crevices and interstices of which are filled by a powder resembling the chrysarobine itself.

This confirms a statement made by Mr. Kemp, of Bombay, in a letter to the writer, that chrysarobine is the "pith" of a tree.

23. Chrysarobine yields (in addition to 1 per cent. of moisture, 7 per cent. of a glucoside, a bitter and a gummy matter, and over 80 per cent. of chrysophanic acid) about 10 per cent. of material insoluble in water or benzol. This residual material when dried was digested in hot strong alcohol. The alcoholic liquid evaporated gave a reddish yellow resin-like body, from which ether extracted (and redeposited on evaporation) a yellow resin-like substance, leaving a red resin-like matter insoluble in ether. The final residue of chrysarobine, insoluble in hot water, hot benzol, or hot alcohol, was found to be woody fibre of a red colour. Exposed portions of the *cæsalpinia* wood before mentioned were noticed to be red.

24. Table showing at a glance the composition of chrysarobine:—

Name of Constituent.	Amount in 100 parts.
1. Moisture	about 1
13. Glucoside	} „ 7
14. A bitter principle or principles	
15. A variety of Arabin	
16 to 20. Chrysophanic Acid	„ 80 to 84
23. Resin-like bodies	„ 2
23. Woody fibre	„ 5½
2. Mineral matter (Ash)	„ ½
	<hr/> 100

25. The glucoside and the bitter principle of chrysarobine deserve further investigation. To one or both may belong a portion of any medicinal activity possessed by chrysarobine when administered internally. In point of quantity, chrysophanic acid is the chief constituent of chrysarobine. Four fifths of chrysarobine is chrysophanic acid.

On the Identity of Goa Powder and Araroba. E. M. Holmes. (*Pharm. Journ.*, 3rd series, v., 801.) The evidence given by Dr. Lima in the *Medical Times and Gazette*, evidently points to the probability that the geographical sources of Goa powder and araroba are as identical as their physiological action. The only difficulty remaining is the very different colour of Goa powder and araroba. With a view of solving this difficulty the author examined the specimen presented to the Pharmaceutical Society eleven years ago by Mr. Kemp. He found it to be of a chocolate brown colour, as then described. Dr. Frazer, however, speaks of it in the year 1874, as a fine yellowish powder; a specimen lately presented to the museum by Mr. Postans, and which came from Treacher & Co., of Bombay, is of a dull ochre, or pale brown colour; and another specimen which the author received is of an umber-brown. The difference in colour cannot therefore be any objection to the identity of araroba with Goa powder. Since Professor Attfield had discovered that araroba, or chrysarobine as it has been lately named, contained a large percentage of chrysophanic acid, it occurred to the author that a rough but ready test of identity would be to ascertain if this body were present in Goa powder. He therefore digested separately a few grains of each specimen in liquid ammonia, alcohol, ether, benzol, chloroform, and strong sulphuric acid, in all of which chrysophanic acid is said to be soluble. In all the specimens the colours of the solutions were similar with the respective solvents; thus the ammonia gave a deep reddish purple solution, and chloroform and benzol deep brown solutions, both in

the araroba and in all the specimens of Goa powder. The author therefore thinks that a more accurate and careful examination by those who have the time and opportunity will prove that these two drugs are absolutely identical.

On the Constituents and Properties of the Genus *Potentilla*. J. M. Maisch. (*Amer. Journ. Pharm.*, 4th series, v., 109.) Of the genus *Potentilla*, of which about one hundred species are enumerated, *tormentil* is the only one occasionally still used in medicine, though formerly several species now obsolete have been employed.

Potentilla anserina, Lin., silver weed, is indigenous to Europe and the northern portion of the American continent. Both the herb and the perennial root have a mild astringent taste, and are said to have been used by the Indians as an antidote to snake poison; while in Europe it was employed in diarrhœa, hæmorrhages, pulmonary complaints, some hepatic disorders, and in dropsy. The leaves are radical, interruptedly pinnate; the leaflets nine to nineteen in number, oblong, deeply serrate, silvery white and downy underneath.

P. fruticosa, Lin., shrubby cinquefoil, likewise inhabits the northern portions of the northern hemisphere. The five to seven pinnæ are linear to lanceolate oblong, entire, silky underneath, and have a mild astringent and bitterish taste. They are used by some Siberian tribes like tea, and were formerly reputed to possess febrifuge properties; externally the leaves were used as a vulnerary.

P. rupestris, Lin., is a native of mountainous regions of Europe and Siberia. The radical leaves are pinnate, and the stem leaves usually three-lobed; they have an astringent taste, and are used in Siberia like tea.

P. palustris, Scop., s. *Comarum palustre*, Lin., marsh cinquefoil, occurs in cool, boggy localities of the eastern and western hemispheres. It is easily distinguished from the preceding and following species, which bear yellow flowers, by its dark purple petals. The three to seven leaflets are oblong-lanceolate, sharply serrate, hoary beneath, and have a somewhat astringent taste.

The species just mentioned have the leaves pinnate; in the following they are palmate, and mostly composed of five leaflets.

P. argentea, Lin., silvery cinquefoil, occurs in dry localities of the Old and New World. The wedge-oblong leaflets are entire towards the base, deeply incised and almost pinnatifid near the apex, green and smooth above, and silvery canescent beneath. Their taste is astringent.

P. tormentilla, Sibth., tormentil, a native of Europe, grows in

meadows, and has obovate or wedge-lanceolate, deeply serrate, green and somewhat shining leaflets, possessing an astringent taste, similar though somewhat weaker than the rhizome.

P. reptans, Lin., creeping cinquefoil, is a European and Asiatic plant, growing in damp localities. Its thin creeping stems bear solitary flowers on long peduncles, and are of a golden yellow colour; the leaflets are elliptical to oblong-obovate, sharply serrate, bright green and slightly hairy above, paler and somewhat pubescent beneath. The taste of the root and herb is sweetish and astringent. This plant (or the tormentil) was probably the *pentaphyllon* of the ancients.

As far as may be judged from the taste, and from the few published chemical experiments, all the species enumerated before contain some tannin, upon which the comparatively feeble medicinal properties mainly depend. The American *P. Canadensis*, Lin., the common cinquefoil or five-finger, resembles the former in taste; and like them, may be supposed to act as a mild astringent. In the January number of the *Charleston Medical Journal and Review*, however, this plant is highly recommended for other purposes. Dr. W. Hanser speaks of it as a most powerful *sudorific* and as a diuretic. He strongly recommends it in the treatment of peritonitis of any kind, but especially *puerperal peritonitis*. He gives large draughts of a strong hot decoction of the plant (leaves, stem, and roots) every half hour, or oftener, till the patient is thrown into full perspiration.

Some years ago, Dr. Richard Moore, of Sumter District, S.C., called attention to this plant as an efficient and useful remedy in the treatment of chronic colds, threatening phthisis; he used it in the form of decoction.

Both Dr. Moore and Dr. Hanser name the plant employed by them *Potentilla reptans*. The Linnæan plant bearing this name, however, is a native of Europe and Asia, and does not occur in this country; it is represented on this continent by *Potentilla Canadensis*, Lin., which resembles it, and is a rather variable species, growing in dry fields and moist thickets. *P. sarmentosa*, Wild., *P. Caroliniana*, Poir., *P. simplex*, Michaux, and *P. pumila*, Pursh, are now regarded as mere varieties of this species, which occurs from North Carolina to Mississippi, and northward throughout Canada. The plant is, however, distinguished from *P. reptans*, by the latter having many slender, nearly smooth and purplish stems, the leaves on longer petioles, leaflets elliptical to obovate, obtuse, serrate, and somewhat hairy, the lateral pairs approximate, or united at base; stipules small oval-lanceolate, entire or few-toothed; petals yellow,

obcordate. *P. Canadensis* has even the summer runners thicker, green, or occasionally purplish, always silky hairy; stem-leaves on shorter petioles; leaflets obovate oblong, rather acute; coarsely serrate, hairy; stipules ovate, acutely toothed; petals roundish obovate, entire or notched.

The botanical characters, it will be observed, are sufficiently distinct for the two species, although their sensible properties are alike as far as odour and taste are concerned. It is scarcely to be supposed that the American plant is possessed of more potent properties than the majority of the plants of the same genus and tribe mentioned above; but the statements made of its efficiency are, such as to call for a careful investigation.

Saponin in the Root Bark of *Chionanthus Virginica*, Lin. R. S. Justice. (Abstracted from an inaugural essay; *Amer. Journ. Pharm.*, vi., 195.) The root bark of the fringe tree is medicinally employed by eclectic physicians. In operating upon it, the author was led to infer the presence of saponin, which was obtained pure, or nearly so, in the following manner:—

One pound (7000 grs.) of the powdered bark was carefully packed in a percolator, and exhausted with strong alcohol; the percolate was a clear reddish brown liquid, having the bitter taste and odour of the bark, and yielding on evaporation 1750 grains, or 25 per cent., of extract, which had an extremely bitter taste, and was perfectly soluble in alcohol and water, partially soluble in ether, and insoluble in chloroform.

From this extract, saponin was prepared, according to Rochleder's process, by dissolving 240 grains of it in water, and adding to the solution baryta water till no further precipitation occurred. The precipitate was collected on a filter, washed thoroughly with baryta water, and redissolved in water. Through the filtered solution, carbonic acid gas was passed till the baryta was entirely precipitated, and the clear filtrate was then evaporated, spread on glass, and dried at low temperature. The result of the experiment was a straw-coloured powder, perfectly soluble in water, the solution producing froth when shaken.

The saponin was not changed in colour by sulphuric acid; nitric acid coloured it reddish brown; caustic potash red, and ferric chloride greenish. Both the saponin and the bitter principle contained in the bark deserve further investigation.

Examination of *Carnauba* Root. E. L. Cleaver, F.C.S. (*Pharm. Journ.*, 3rd series, v., 965.) A small quantity of this root having been placed at the author's disposal by Messrs. Symes

& Co., of Liverpool, he endeavoured to ascertain whether or not it contained any easily isolated active ingredient.

The sample was in pieces from 12 to 18 inches long, of about the thickness of the little finger, consisting essentially of two parts: the external or cortical part being very friable, easily separated and powdered, and having a mawkish slightly bitter taste; the internal being hard and tough, extremely difficult to powder, and totally devoid of bitterness or other flavour.

The chemical experiments quoted prove that carnauba root does contain an alkaloid, which is present, however, in so small a quantity as to render it imperative to work on large quantities of material for its successful isolation. This the author intends to do at some future time, when the supplies of the root are more plentiful.

Carnauba root also contains an acrid resinous body, a red colouring matter, a variety of tannic acid, and a small portion of volatile oil.

Asclepias Incarnata, Lin. J. Y. Taylor. (Abstract from an inaugural essay; *Amer. Journ. Pharm.*, v., 246.) This plant is known under the names of rose-coloured silk-weed, white Indian hemp, swamp milk-weed, flesh-coloured asclepias, etc., and is found in almost all parts of the United States. The rhizome and rootlets are official.

A cold infusion of 1000 grains of the powdered root in four fluid-ounces of water had a decidedly acrid taste and a slight alkaline reaction to test paper. On heating it a coagulum appeared (albumen), and after acidulation with muriatic acid, a whitish precipitate occurred with iodohydrargyrate of potassium; the alkaloid thus indicated was not obtained in a pure state. Treatment with carbonate of sodium, and afterwards with diluted muriatic acid, produced a copious gelatinous precipitate, which was partly soluble in acetic acid; the presence of a pectin compound was thus proved. The powder exhausted with cold water gave, with iodine, evidence of the presence of much starch.

A tincture made with alcohol, sp. gr. .835, had a fine, brownish yellow colour with a tinge of green, was slightly acid to test paper, and possessed a less disagreeable taste than the infusion. On evaporating the tincture, 1000 grains of the root were found to yield 210 grains (21 per cent.) of extract, which consisted of fixed oil and two resins, one soluble and the other insoluble in ether, the former of which had a stronger acrid taste than the latter.

A trace of volatile oil was obtained on distilling the root with water. Glucose was detected by Trommer's test in the infusion and tincture.

The air-dried root yielded, on an average of three experiments, 8.25 per cent. of ash, containing silica, and chlorides and sulphates of potassium, sodium, and calcium.

The organic constituents are albumen, pectin, starch, glucose, an alkaloid, fixed oil, volatile oil, and two acrid resins.

On the Alkaloids and Acids of *Sanguinaria Canadensis*. L. C. Hopp. (Abstract of an inaugural essay; *Amer. Journ. Pharm.*, 4th series, v., 193.) In preparing the alkaloids the powdered root was exhausted with alcohol by percolation, and the resulting tincture evaporated by means of a water bath to the consistency of a thin extract; this was digested with sufficient hydrochloric acid for three days, and then poured into water with constant stirring until it was thoroughly diffused, when it was permitted to stand for twenty-four hours, to allow the resin to settle to the bottom. It was now filtered, the filtrate evaporated to half its bulk, mixed with solution of ammonia, and the purplish brown precipitate which formed, collected on a filter, well washed with water, dried, and repeatedly agitated with ether until it was completely exhausted. The sanguinarina sulphate was obtained by adding a mixture of sulphuric acid and ether to the ethereal solution; the crystalline crimson precipitate was then purified by recrystallization from a hot alcoholic solution.

Iodothydrargyrate of potassium produced, in its solution, a bright red, and ammonia a white precipitate.

The supposed puccina was obtained according to Mr. Wayne's process. The ethereal solution, from which the sanguinarina sulphate had been separated, was of a light straw colour; the ether was slowly distilled off nearly to dryness, when a residue of a reddish brown colour remained in the retort, which dissolved in alcohol with a red colour. Hydrochloric acid was added in very slight excess, and the solution set aside to evaporate spontaneously. The first crop of crystals was of a granular form, similar to sanguinarina sulphate, and of a light reddish brown colour; the second crop was darker. Iodothydrargyrate of potassium produced a precipitate of a yellowish red colour, and ammonia one of a purplish brown, this last furnishing a purple solution with chloroform.

Supposing that it still contained sanguinarina, it was dissolved in water acidulated with HCl, ammonia added, the precipitate washed with water, dried, and agitated with ether. On passing hydrochloric acid gas through this solution, hydrochlorate of sanguinarina was precipitated of a crimson colour. The portion that was not taken up by ether was found to consist of resin and some

of the same colouring matter, which was the cause of the purplish colour of the ammonia precipitate and of its solution in chloroform.

The resinous substance obtained by the precipitation of the concentrated tincture in water was treated with alcohol, the solution acidulated with hydrochloric acid, and poured into a large quantity of water with constant stirring; after twenty-four hours the liquid portion was filtered, evaporated to half its bulk, and set aside to crystallize, when a substance similar to the supposed puccina, but of a lighter colour, was deposited. It was dissolved in acidulated water, precipitated by ammonia of a purplish brown colour, collected on a filter, washed with water, then dried, and agitated with ether, which did not take it up entirely. Hydrochloric acid gas was then passed through the solution to precipitate the sanguinarina. The portion that was not taken up by the ether consisted of resin and colouring matter.

Believing that the resin which was precipitated from the above acidulated alcoholic solution by pouring it into water was not entirely free from sanguinarina, it was treated with acidulated water, precipitated by ammonia, the precipitate treated with ether, and HCl gas passed through the ethereal solution: the same result was obtained as with the supposed puccina. The residue, insoluble in acidulated water, was dissolved in alcohol, ammonia added in slight excess, and then shaken with three times its bulk of ether; the alkaloid taken up by the ether proved to be sanguinarina, while a brown tasteless and odourless resin remained undissolved.

The residue left, after exhausting the first ammonia precipitate with ether, was treated with dilute acetic acid, and the solution evaporated by means of a sand bath to the consistence of a soft extract. This was then repeatedly boiled with water acidulated with HCl, and the solution treated with ammonia, ether, and hydrochloric acid gas as before, when the sanguinarina salt was obtained. The portion insoluble in the acidulated water was of a yellowish brown colour. A mixture of it with some sanguinarina and resin when boiled with acidulated water, and mixed with iodohydrargyrate of potassium produced a yellowish red precipitate; ammonia yielded a purplish brown precipitate, which dissolved with a purplish colour in chloroform,—these reactions being exactly the same as those produced with the supposed puccin.

Sanguinarinic acid was obtained according to Newbold's process (*Amer. Journ. Pharm.*, 1866, p. 496). To the clear solution from which the sanguinarina had been precipitated by ammonia, acetate of lead was added, and a precipitate of a greyish white colour

obtained, which was collected on a filter, well washed, suspended in water, and decomposed by sulphuretted hydrogen gas. The filtrate when evaporated to the consistence of a syrup, deposited no crystals on standing. It was of a dark reddish brown colour, turned blue litmus paper red, and had a sour, rather pleasant taste. Dissolved in water, and mixed with lime water, no precipitate was produced, until heated to boiling. This precipitate, after washing, was suspended in water acidulated with acetic acid. Oxalic acid, carefully added, precipitated the calcium, and, after treatment with alcohol, citric acid remained in solution, which with chloride of calcium produced a precipitate soluble in ammonium chloride, and being reprecipitated on heating.

Alcohol was added to the clear solution from which the citrate of calcium had been precipitated, and a dense flocculent precipitate produced, which was dissolved in water, acidulated with acetic acid, and the calcium precipitated from the solution by oxalic acid and alcohol. The filtrate behaved like a solution of malic acid. Acetate of lead produced a white precipitate, which, on being heated with water, fused, but dissolved in warm acetic acid. Lime water produced a precipitate only after the addition of alcohol.

A sample of so-called sanguinarinic acid, prepared by Mr. Newbold, was obtained from the College cabinet; it had a slight acid taste, and iodohydrargyrate of potassium produced in its solution a precipitate, showing the presence of some sanguinarina, while that obtained by the author was not affected. To lime water Newbold's acid behaved precisely as described above.

The investigations prove the non-existence of puccina, and that the supposed sanguinarinic acid is a mixture of citric and malic acids.

Notes on Morocco Drugs. Dr. A. Leared and E. M. Holmes. (*Pharm. Journ.*, 3rd series, v., 521.)* Specimens of the drugs thus marked (†) are in the Museum of the Pharmaceutical Society. Specimens of the plants thus marked (‡) are in the Herbarium of the Pharmaceutical Society. The drugs thus marked (§) were not recorded in the last paper.

LEAVES, FLOWERS, AND PLANTS.

Aflau.—This is *Mentha Pulegium*, L., not a species of *Thymus*, as before stated.

† *Artim*.—This is *Retama Rætam*, not Spanish broom. At Tangier,

* A previous communication on this subject will be found in the *Pharm. Journ.*, iii., 621–630, and 684.

the name "artim" appears to be restricted to this species; but some dried flowers received from Mogador, under the same name, include also *Genista candicans*, L.,† and *G. linifolia*, L.† "Artim" is probably, therefore, a generic name for several leguminous plants used as food for cattle.

The bitter roots are said to be used by the Arabs for internal pains, and the shoots macerated in water are applied to wounds. The shoots much resemble in appearance those of *Sarothamnus scoparius*, but are slenderer, more branched, and the branchlets are longer.

Azeer.—These leaves are those of *Rosmarinus officinalis*, L.

Effersue, vide Roots, art. Ipherscul.

†*El Halhal*.—This drug consists of two plants, *Lavandula stoechas*, L.,† and *L. dentata*, L. The first named occurs in by far the larger proportion, so that *L. dentata*, L., may be, perhaps, only an accidental admixture. The flowering specimens received under the same name are those of *L. stoechas* only.

§*El Habeeka*.—A single flowering specimen only received. It is *Parietaria officinalis*, L. Common pellitory.

†*Ghassoul*.—The structure of the fruit, which is mixed up with the stalks and leaves, is evidently that of some calycifloral plant, with a half-inferior ovary, nearly allied to the genus *Mesembryanthemum*, but the authors have not yet succeeded in identifying the species.

A specimen of a plant received under the very similar name "ghussul," or "tegaghust," is a species of *Silene*, but is evidently not the plant yielding ghassoul, for *Silene* has a superior ovary.

Flayu, see *Timza*.

§*Grom-azdo*.—These leaves resemble in general character those of the *Crataegus oxyacanthus*, L., and probably belong to some species nearly allied to it. It is used by women after parturition.

†§*Khobaizeh*.—The whole herb is used. It is *Malva parviflora*, L., and is readily recognized by its wrinkled fruit. This name would, however, appear to include other species of the Malvaceæ, for a specimen consisting of flower and leaf, received under the name of "khobaizeh," belongs to *Lavatera hispidula*, Desf. It is used as a demulcent in catarrh.

†*M'roy*, *Maroui*, or *Marout*.—These are several ways of spelling the Moorish name for *Marrubium vulgare*, L. The specimens examined all belong to the variety β . *lanatum*.†

Marout Zarbe.—The leaves are those of *Salvia triloba*, L., a plant with a woolly stem and leaves, which may perhaps owe its Moorish name to its similarity in this respect to *Marrubium vulgare*.

†*Ruta*.—This name probably includes two or more species of *Ruta*; a flowering specimen received under this name belonged to *Ruta bracteosa*, D.C., while the drug consists of *R. angustifolia*, Pers.

†§*Sabardo*, or *Asbardo*.—The green stem. These curious cactus-like stems belong to a composite plant. *Kleinia pteroneura*, D.C., nearly allied to the common groundsel.

The stem is about the thickness of the forefinger, leafless, except at the top, where there is a rosette of leaves, furrowed externally, and has a large discoid pith; the branches are nearly equal in size, quite erect, and parallel with the stem, and remind one of a candelabra with a number of candles in it.

It is used externally for "pains in the hands and feet" (rheumatism?).

†*Sadear*, or *S'dia*.—These words are different ways of spelling the Moorish name for *Teucrium polium*, L. A nearly allied species, *T. montanum*, L., was used in this country during the last century under the name of poly-mountain, and appeared in the list of materia medica of the London Pharmacopœia as late as 1763.

†§*Shiba-el-Agoz*.—This name is applied to a species of *Artemisia*, *A. arborescens*.

†*Taserkina*.—These are the leaves of a variety of *Thymus vulgaris*, L., which has the leaves tapering more towards the base than in the common form.

Timza.—This is not *Mentha sylvestris*, L., but *Mentha rotundifolia*, L., which is distinguished from the former by its wrinkled, obtuse leaves. The authors have also received *M. rotundifolia* under the name of "menta." A specimen without flowers, which closely resembles in appearance the common *M. viridis*, L., except that the leaves are stalked, is called "flayu." The taste, also, is similar to that of *M. viridis*.

†*Zater*.—This is not a *Thymus*, but *Origanum compactum*, Bth.

SEEDS.

†*Sanous*.—This seed is that of *Nigella sativa*, L. It is small, about one eighth of an inch long, with projecting angles, quite black and reticulated. It is supposed by some to be the fitches mentioned by Isaiah.

BARK.

††*Edro*, or '*Dro*.—This is the bark of the *Pistacia lentiscus*, L. It has been identified from a portion of the plant received from Morocco.

ROOTS.

†§*Ablaluz*.—This consists of the rootstock and tubercular roots of *Asphodelus ramosa*, Moench. The rootstock is about two inches long and three quarters of an inch in diameter; of a pale brown colour, with numerous fleshy fusiform tubercular roots attached to it of about the thickness of the forefinger. The taste is insipid. The roots seem very tenacious of life, giving off shoots without being moistened, and in dry air.

§*Adad*.—This is a large, somewhat cylindrical root, more than a foot long, and about two inches in diameter. It has a crown consisting of several stems, springing from the contracted upper portion of the root. The transverse section is white and starchy, but, nevertheless, is hard and tough, and shows about six ill-defined concentric rings, marked with horny-looking radiating lines, which, under a lens, are seen to consist of vessels containing matter resembling caoutchouc. This caoutchouc has exuded from several parts of the root, where it was apparently injured in the fresh state. The smell and taste of the root are aromatic. The root is certainly not that of *D. mezereum*, L., as previously stated. A leaf received as that of adad appears to belong to some species of thistle. Leo Africanus* says of adad:—"The herbe thereof is bitter, and the root is so venomous that one drop of the water distilled thereout will kill a man within the space of an hower, which is commonly known even to the women of Africa." It is taken for debility and low spirits. Not yet identified.

†§*Ark abu*.—This root occurs in pieces varying from one third to half-inch in diameter, and several inches in length. It is dark brown externally, with numerous closely placed annular ridges and numerous small warts, and is sometimes branched in the upper part like dandelion root. The medutullium is large, white, and starchy, occupying about two thirds of the diameter of the root. The cortical portion is white internally, and has a ring of resinous-looking rays next to the medutullium. The taste is insipid. It is used for "pains in the bones" (rheumatism?). Not yet identified.

†*Ark sus*.—This consists entirely of the subterranean stem of a species of liquorice; the plant yielding it is probably *G. echinata*, L., judging from its bitterness and longitudinally cracked epidermis.

†*Beresimis*.—This root has a thick brown spongy cortical portion, and a white soft radiate medutullium. It tastes somewhat like turnip, but without any pungency. Not yet identified.

* Translation by John Pory. London, 1600, page 357.

†§*Emsleh ander*.—This is a tapering cylindrical root, varying in thickness from half to one inch, and from six to nine inches long, deeply furrowed, and of a dark brown colour externally. It is readily distinguished from other roots by its black, horny, cortical portion, which has a polished or waxy appearance when cut. The medullium occupies three quarters of the diameter, and is generally of a more or less dark grey colour, with sometimes a paler zone next to the bark. The taste is sweetish and slightly bitter. It is used for sore eyes, the root being ground very fine, and passed under the eyelids. The leaves and stems attached to the root are evidently those of *Verbascum sinuatum*, L.

§*Ipherscul*.—This drug is the root of *Cistus salvifolius*, L. It is a hard woody root, of three quarters to one inch or more in diameter, with a rather thick spongy cracked bark, of a peculiar greenish or olive-brown colour. The medullium is of a dirty white colour, and is hard and woody. The plant appears to have grown in a reddish soil, as the surface of the root bark is of a reddish hue. A plant received under the somewhat similar name of *effersue* is *Pteris aquilina*, L. The taste is earthy, gritty, and very slightly aromatic. It is taken for palpitation caused by sudden fright, etc.

†*L'fuely*.—This root is not that of *Raphanus sativus*, L., that esculent being known in Morocco under the name of "fijjil." The root of *L'fuely* is from half to one inch or more in diameter, rather smooth, and of a dull, dark red colour externally, and whitish and very fibrous internally. It appears to have been of a fleshy character when fresh, the cortical portion being very loosely attached to the medullium. The taste is saltish. Not yet identified.

†*Oden él Haloof*.—This consists of a short, prostrate rhizome, terminating in a hairy bud, and giving off below a tuft of straight, unbranched roots of a reddish brown colour, about the size of a crowquill, and finely striated longitudinally. The odour resembles that of *arnica*, and the taste is aromatic and somewhat acrid. It is taken for strangury. Not yet identified.

†§*Tafriba*.—This root is of a dull brown colour, from half to one inch in diameter, with numerous transverse striæ and a few scattered warts. The medullium is white, and the cortical portion thick, white, and spongy. The taste is saltish and pungent. It is supposed to strengthen the nerves, etc. The leaves and flowers received as those of *tafrifa* belong to *Statice mucronata*, L.

†*Taserka*.—This is a large, somewhat woody root, twelve or eighteen inches long, two inches or more in diameter at the top, and much branched, and tapering to half an inch in the smaller branches.

The cortical portion is brown, spongy, and rather thin in proportion, being on the average not more than a line in thickness. The medullium is of a yellowish colour, with the concentric rays not visible, and in many of the pieces the medullary rays are of an ash-grey colour (perhaps from imperfect drying), and thus gives a distinctly radiate appearance to the medullium. The root is almost tasteless. Attached to the root are portions of leaves which appear to belong to some species of *Carlina* or *Carduus*. It is taken to mitigate thirst.

†*Toussergent*.—This is the root of *Corrigiola telephiifolia*, Pour, ‡ Nat. Ord. Illecebraceæ. Specimens of the plant in flower, from Morocco, are in the Herbarium of the Pharmaceutical Society. Externally the root is pale brown and twisted, rather knotty at the top, more or less fusiform, from a quarter to half an inch in diameter, and from two to four inches long. Its internal appearance is very characteristic. The transverse section is of a yellowish white colour, with three to five concentric rings, which have a horny and translucent appearance. The taste is acrid, causing a tingling sensation like that produced by senega. Leo Africanus says concerning “tauzarghente”—“This root, growing in the western part of Africa, upon the ocean seashore, yeeldeth a fragrant and odoriferous smel, and the merchants of Mauritania carry the same into the land of Negros, where the people use it for a most excellent perfume, and yet they neither burne it nor put any fire at all thereto; for being kept only in an house, it yeeldeth a naturalle sent of itselfe. In Mauritania they sell a bunche of these rootes for halfe a ducate, which being carried to the land of Negros is sold again for eightie or one hundred ducates, and sometimes for more.” The root we have received is not so powerfully odorous as represented by Leo Africanus. It has a very faint odour, like that of orris-root.

†*Waskiza*.—This root occurs in slender pieces, of a pale brown colour externally, barely a quarter of an inch in diameter, and about three or four inches long. The root is sparingly branched. Internally it is pale, with a large and faintly radiate medullium. The taste is earthy and slightly acrid. It is used as an emetic. The plant received as *waskiza* is *Euphorbia terracina*, L.

EXUDATIONS.

†*Alkeptum*.—This resin occurs in small yellowish, rather dirty tears, in colour and taste resembling American frankincense. It is probably the product of some coniferous plants. Its Spanish name, “gomma di pinezia,” gives probability to this suggestion, indicating as it does that it is derived from a species of fir. The

resin is used in urinary complaints, accompanied by pains in the loins and deposits in the urine. It is administered mixed with bitters and honey. Not yet identified.

Notes on Brazilian Drugs. E. M. Holmes. (*Pharm. Journ.*, 3rd series, v., 905, 985.) The following list is a description of some drugs lately presented to the Museum of the Pharmaceutical Society by Messrs. Cyriax & Farries; the specimens were collected in the province of Rio, in Southern Brazil. For convenience of reference they are arranged in alphabetical order according to their native names. The specimens were accompanied by a manuscript list, drawn up by Dr. G. S. Barnsley, together with remarks upon the medicinal properties of the various drugs. Most of these appear to have been copied from Martius's work; only his original statements will be noticed.

Braço do Preguiça or *Velame*.—This drug consists of large brittle leaves of a papery texture. They are, as far as can be judged from their broken state, about a foot long and nine inches broad, of a dark green colour above, and white and hoary underneath. The hoariness is owing to the under side of the leaf being densely covered with stellate hairs, which are almost entirely absent on the upper surface of the leaf. The veins are depressed on the upper side of the leaf and prominent beneath. The stalks and petiole are also densely covered with a thick coat of down, and with a number of linear brownish scales like those on the base of the fronds of ferns. The plant is referred by Dr. Barnsley to *Solanum jubatum*, Dumal. The leaves correspond exactly to specimens of that species in the British Museum. An entire leaf, however, sent with the drug, which is without scales on the petioles, is referable rather to *Solanum bullatum*, Vell. In the collection of the late Dr. Pereira, the same drug occurs under the name of "panacea," but from the fragmentary state of the leaves it is impossible to say to which of these two species it may belong. According to Dr. Barnsley, the leaves and root are used in the form of infusion or extract, and are considered to possess excellent antisiphilitic properties; they are also sometimes used as a purge.

According to Martius, *braço do preguiza* is used as a resolvent in congestion of the bowels, and as an external application for cleansing and healing wounds and ulcers.

Bútua.—This root corresponds in structure and taste with true Pareira brava root, but is of a more yellowish hue than is usual in that drug. A smaller piece, labelled "*abutua negra*," exactly corresponds with the usual specimens of true Pareira brava met with

in commerce, and is without doubt the root of *Chondodendron tomentosum*, R. et P. Dr. Barnsley states that it is used in the form of infusion, extract, and powder, in chronic hepatitis, dyspepsia, etc. He makes one extraordinary statement with regard to this drug, for which I am totally unable to account: "This root has a basic salt which unites with sulphuric acid, is white, etc., almost like that of cinchona. It is exported to Europe in great quantities to adulterate quinine." This salt has been examined by Mr. J. Moss, F.C.S., and proves to be sulphate of quinidine.

Caroba.—"This specimen consists of the leaves of two nearly allied plants, one of which has serrate and the other entire leaflets. The serrate leaved species is known as '*Caroba paulistana*,' and the one with entire leaves as '*Carobinha*' or '*Carabo da muida*.' The *Carobinha* consists of bipinnate leaves from 12-18 inches long, with 7-10 pair of pinnæ, each pinna having about eight pair of leaflets and an odd one; the leaflets are obovate, slightly unequal sided, sessile, but tapering below; the leaflets in size and texture resemble the leaves of *Chimaphila umbellata*. The margin of the leaves is entire, and the leaves are smooth on both sides, and minutely dotted beneath, but the dots are not transparent. The petiole is slightly winged on its upper surface, so as to appear canaliculate, and the rachis of the pinnæ is also slightly but more distinctly winged. The leaves appear to correspond well with those of *Jacaranda oxyphylla*, Cham."

The *Caroba paulistana* has leaves and leaflets similar to those just described; but the leaflets are serrate about the middle of the leaf and tapering at both ends, and minute hairs are sparingly scattered over the leaf. It seems to correspond well with the description given of *Jacaranda paulistana* in De Candolle's *Prodromus*. Martius gives this name as synonymous with *Jacaranda oxyphylla*, Cham., of which it may, perhaps, be only a variety. The leaves of both species have a distinctly bitter taste.

According to Martius, other species are also used under the name of *Caroba*. Among these are *J. procera*, Spreng., which has leaves abruptly pinnate, with the pinnæ imparipinnate, and the leaflets elliptical, wedge-shaped, and obtuse; *J. subrhombea*, D.C., which has bipinnate leaves, with both leaves and pinnæ imparipinnate, the leaves having not more than four pair of pinnæ, and the pinnæ not more than five pair of leaflets; *J. Caroba*, which has abruptly bipinnate leaves, with not more than four pair of imparipinnate pinnæ, and the pinnæ with not more than six pair of leaflets, which in this species are elliptical and serrate.

From the leaves are prepared an infusion, a decoction, and a fomentation, which are used in syphilis and skin diseases arising from it, in which, according to Dr. Barnsley, its effects are most marked. He states that it is a favourite remedy in Brazil.

Casca d'Anta.—This is a thick yellowish white bark. Both the inner and the outer surfaces are smooth. When cut transversely the substance of the bark is seen to be made up of numerous resinous granules, the outer layer being very thin and stratified, of a purplish colour, infiltrated with yellowish powder (whether this powder be natural or of a fungoid nature, the author was unable to judge from the small piece received). The taste is bitter and slightly pungent. Dr. Barnsley attributes it to *Drimys granatensis*, Linn., which is certainly not correct, the bark of that tree being of a dark reddish brown colour, and its inner surface very rough. An infusion and a tincture of casca d'anta, according to Dr. Barnsley, are used in dyspepsia, debility, leucorrhœa, etc. He further remarks that it is a very valuable tonic, and that he prefers it to quassia or cinchona bark; that it is very abundant, and that the tree grows to an enormous size.

Cipó sumá.—This root occurs in pieces of a pale greyish brown colour, and of a very dense and horny substance, so much so that it is very difficult to cut. The pieces vary in thickness from that of the thumb to that of an ordinary lead pencil. The external surface is much wrinkled longitudinally, and covered with numerous warts. A transverse section shows that the medutullium occupies nearly the whole of the root, is of a yellowish white colour, and is marked with a number of horny-looking undulating lines and innumerable horny dots. Under a lens each dot is seen to enclose a bundle of porous vessels. The bark of the root is scarcely distinguishable, except as a dark line at the circumference of the root. The taste is like that of a raw potato, but has a peculiar acidity like that of senega. Mixed with this root are a number of pieces of the stem of some species of *Aristolochia* of the same colour externally, but internally distinguished by having a large porous medutullium with distinct medullary rays, and by the outer bark being of loose texture, dark grey in colour, and about a line in thickness, the medullary rays running through it. It has a slight acidity only. Cipó sumá is referred by Dr. Barnsley to *Anchietea salutaris*, St. Hil., a Violaceous plant. He has probably followed Martius in this. Martius, however, only attributes the Sipó sumá of S. Paulo and Minas Geraes, not that of Rio Janeiro, to the above-named plant. A piece of the plant accompanying the root is certainly not *Anchie-*

tea salutaris, since it has opposite leaves. As the specimen has neither flowers nor fruit, it is not possible to identify it.

Erva do Rato.—This drug consists of leaves, but they arrive in so injured a state, that it is not possible to describe them. The leaves and fruit, in the state of powder, are used in Brazil to poison rats and mice. Dr. Barnsley attributes the drug to *Palicourea Marcgravii*, St. Hil. He states that it is a most deadly poison, and that a great number of mules and sheep are annually killed by eating it, death following in five to eight hours after ingestion. According to Martius, both this species and *P. nicotianæfolia* are powerful poisons, but the latter in small doses is used in veterinary practice for dysuria in horses and mules; while two other species, *P. officinalis*, Mart., and *P. densiflora*, Mart., possess diuretic properties, and are used in syphilis, rheumatism, etc. He states that their action resembles that of digitalis in its effect upon the heart. There can be no doubt that the plants of this genus possess powerful properties, and are certainly worthy of scientific investigation.

Fruita de Gentio.—This drug consists of small baccate fruits of a yellowish colour, about the size of a filbert, and containing from four to six flat seeds immersed in dried pulp. Each seed is about half an inch in diameter, and one eighth of an inch in thickness; the seed is notched at the base, with the micropyle forming a little projection in the notch; the nucleus is oval, and occupies only a small portion in the centre of the seed; the circumference of the seed, to the depth of one eighth of an inch, consists of a hollow raised rim, so that the portion of the seed containing the nucleus is oval and depressed. The nucleus is exalbuminous, and consists of two flat, oily cotyledons, with the radicle near the hilum. The cotyledons are tasteless, but the pulp in which the seeds are immersed is extremely bitter. According to Dr. Barnsley, the fruit and seeds are used in the form of powder and tincture as a drastic purge, and are a favourite remedy with the lower class of Brazilians. He does not know the plant yielding the drug, but the characters above described show that the seeds probably belong to the Cucurbitaceæ.

Japicanga.—This is the rootstock or “chump” of some species of sarsaparilla. It has but a small portion of rootlets attached; these have a hard woody medullium, a thin dark brown cortical portion, and are smooth externally. It has no distinct taste. According to Dr. Barnsley it is used in the province of Rio as a substitute for the sarsaparilla of the Amazons. He refers the drug to *Smilax glauca*, Mart. The name japicanga, which is variously

spelt japecanga, jupicanga, inhapecanga, is a generic term for any kind of sarsaparilla in Brazil.

Jarrinha.—This drug occurs in slices about half an inch thick, and two inches in diameter; the medutullium is about one inch in diameter, and has a radiate appearance owing to the presence of a number of very narrow yellowish woody wedges, which have thick white medullary rays between them, and the woody wedges when examined with a lens are seen to be full of large porous vessels. Outside of the medutullium is a horny portion a quarter of an inch in thickness, and outside this layer is a soft corky layer of the same thickness. It has the peculiar camphoraceous odour common to several nearly allied species of *Aristolochia*. The taste is slightly acrid but not bitter. It is certainly the root of a species of *Aristolochia*, and is attributed by Dr. Barnsley to *A. cymbifera*, Gom. (Mart.?). He states that the root is very useful for colicky pains, and that it is used as a tonic, and for gangrene. By the natives it is esteemed a sure remedy for snake-bites. It is very abundant in every part of Rio and S. Paulo. Several species of *Aristolochia* are used under the name of Sipo de Jarrinha or de Mil-Homens. According to Martius they are used for the same complaints for which valerian is used in this country, and are considered superior to *Aristolochia serpentaria*.

Pipi.—This drug is a long-branched woody root, about eighteen inches long, half an inch in thickness in the upper part, and tapering downwards to one eighth of an inch. The root is pale brown and smooth externally; a transverse section shows a large white woody medutullium, filled with minute pores, but with the medullary rays indistinct, the cortical portion very thin, of a brown colour, and readily scaling off when the root is bent. The taste is slightly bitter, and causes a sensation of tingling when chewed.

Dr. Barnsley states that a tincture of the root forms an admirable remedy for chronic rheumatism, lumbago, and muscular paralysis, and that it is much used in the province of Rio by country physicians. Martius refers the plant yielding the root to *Petiveria tetrandra*, Gom. The leaf which accompanied the root is, however, not that of *Petiveria tetrandra*, Gom., but that of some twining plant with opposite leaves—probably belonging to the Malphigiaceæ.

Quina quassia.—This drug is a bark of a greyish colour externally, with a number of short pale brown transverse scars. The epidermis is very thin, and can be readily scratched off by the finger nail, leaving the white portion underneath exposed. The bark is fibrous, but is nevertheless very tough, and breaks with a

rather short fracture. When cut transversely with a sharp knife the layer just inside the epidermis (mesophlœum) is seen to be irregular in outline, and much whiter than the inner portion. The taste is intensely bitter.

Dr. Barnsley does not know to what order the plant yielding it belongs, but he having sent a portion of the plant with the barks, the author has been enabled (with Professor Oliver's kind assistance) to identify it as the *Picrasma Velosii*, Pl., of the natural order Simarubaceæ.

With regard to this bark, which is not mentioned by Martius, Dr. Barnsley states that it is used in dyspepsia and in intermittent fevers, and that he has employed it in the latter with decided success. With the bark he sends a portion of white crystalline powder, which he says was given to him by a native forester and gold miner of the woods of S. Paulo, who was well acquainted with the medicinal herbs of that district, and who stated that he obtained it from this bark. This crystalline powder has been examined by Mr. S. Plowman, who finds it to be chiefly sulphate of quinine with a little hydrochloride. The barks of the Simarubaceæ are not known to yield quinine, hence it is probable that Dr. Barnsley has been imposed upon.

Saponacea.—This is a kind of soap berry, the fruit of a species of *Sapindus*, possibly of *S. divaricatus*, Willd., to which Guibourt refers the soap berries he received from Brazil, and which is the only species mentioned by Martius.

Dr. Barnsley states that he has made an excellent tooth-wash from them, and suggests that, perhaps, some species of this berry is used in making the London "floriline."

Tayuyá.—This is a long slender root varying in size from quarter to one third of an inch, scarcely branched, brown externally, internally of a paler brown, and full of large pores, which are easily visible to the unaided eye. The cortical layer is not very distinct. The taste is bitter.

Dr. Barnsley refers this root to *Trianosperma Tayuyá*, Mart., but Martius describes the root of that plant as being tuberous and turnip-shaped. The leaf sent with the root is apparently that of a *Trianosperma*; but as there are no tuberous roots with the *Tayuyá* received, it is probably the root of another plant of the same genus. An infusion, tincture, or extract of the root is used as a drastic purge. It has properties analogous to elaterium. In the province of Rio it is a common plant.

Timbo.—This drug consists of a very large woody root or pres-

trate stem, three or four inches in diameter, and much branched. Externally it has a dirty white colour, with numerous warts scattered over it, and is of a rough aspect, owing to depressions, scars, and a few transverse ridges; the smaller portions are, however, only wrinkled longitudinally. The central portion or medullium of the root is yellowish white, with a number of fine horny concentric rings; the bark of the root is distinct, thick, and starchy, and of the same colour as the medullium. The taste is not bitter. When chewed the root causes only a slight but persistent tingling of the tongue.

According to Martius it is the root of *Paullinia pinnata*, L., and possesses acrid and narcotic properties, acting especially on the kidneys and brain; he compares it to aconite, and states that the negroes prepare a slow poison from it. Dr. Barnsley is inclined to think that the above-named plant does not produce it, but that it is the root of *Physalis heterophylla*, Nels. The leaves accompanying the specimen being imperfect, it is impossible to say what the plant is, but the leaves are more like those of a Sapindaceous than of a Solanaceous plant. It seems to possess powerful poisonous properties which may perhaps be worthy of investigation.

Velamé or *Braço de Preguiça*.—This is the root of *Solanum jubatum*, Dunal. Through an oversight its description was not given under *braço de preguiça*. The root is in somewhat flexuose pieces, externally resembling belladonna root in colour, varying from half to one inch in thickness. Internally the root is woody, the medullium being of a pale yellowish colour, with very numerous medullary rays, which are not visible to the naked eye, but are readily seen with the aid of a lens. The cortical portion is very thin, and seems to consist of several extremely thin layers; the outer layer when scraped with the nail or with a penknife shows that the under layers are of a pale lilac-grey colour and chalky appearance. This character does not occur in any other root, and at once distinguishes this drug. It appears to be almost tasteless. It is used for the same purposes as the leaves described before. Martius does not mention either *velamé* or *panacea* in connection with *Solanum jubatum*, Dunal.

Ginseng (*Panax Schinseng*, of Nees). J. R. Jackson. (*Pharm. Journ.*, 3rd series, v., 86; from the *Gardener's Chronicle*.) The extraordinary properties reputed to belong to Ginseng by the Chinese is sufficient to cause a considerable amount of interest in the root, though we know British pharmacists look upon it as a delusion, and consider it to have no real effect. Notwithstanding this, a

great deal has been written on the subject in many different languages, and though the Chinese article which is the root of *Panax Schinseng*, Nees, has, it would seem, never been used in European pharmacy, an allied species, *P. quinquefolium*, has been used in America, and appears in Wood and Bache's "United States Dispensatory." It is, however, there considered to be little more than a demulcent; and though kept in the shops, it is chiefly to supply the wants of those who have acquired a taste for it, for it is not really employed as a medicine. The root has a sweetish bitter taste, and is somewhat mucilaginous. It occurs in pieces usually about three or four inches long, often partially divided but joined together at the base. When clean it has a semitransparent appearance. It is esteemed by the Chinese as a most valuable medicine, being given as a tonic in cases of debility, and, in fact, applied in almost all diseases provided the patient is sufficiently wealthy to pay for such an expensive medicine.

A very interesting account, showing the value set upon this root by the Chinese, as well as the great care paid by them to its selection, appeared some time since in Lockhart's "Medical Missionary in China," from which the following is quoted. He says:—"Presents of this root are frequently made, and accompanying this medicine is usually sent a small, beautiful, double kettle, in which the ginseng is prepared as follows:—The inner kettle is made of silver, and between this and the outer vessel, which is a copper jacket, is a small space for holding water. The silver kettle, which fits on a ring near the top of the outer covering, has a cup-like cover in which rice is placed, with a little water; the ginseng, with water in the inner vessel, a cover placed over all, and the apparatus put on the fire. When the rice in the cover is sufficiently cooked the medicine is ready, and is then eaten by the patient, who drinks the ginseng tea at the same time."

A Shanghai ginseng merchant who, it is said, gave his whole attention to the sale of this article, is described as having kept his stock in strongly bound boxes. When any one wished to see his stock "he deliberately fetched his keys, and calling an attendant to shut the door, so that neither strangers from the outer shop nor damp air might enter his clean and beautifully furnished sanctum, which was also thoroughly dry, proceeded slowly to unlock the boxes. Opening the outer box, he removed several paper parcels, which appeared to fill the box, but under them was a second box (or perhaps two small boxes), which when taken out showed the bottom of the large box, and all the intervening space occupied

with more parcels. 'These parcels,' he said, 'contain quick-lime for the purpose of absorbing any moisture, and keeping the boxes quite dry;' the lime being packed in paper for the sake of cleanliness. The smaller box which held the ginseng, was lined with thin sheet lead; the ginseng, further enclosed in silk wrappers, was kept in little silken covered boxes. At last, after opening many receptacles, the actual medicine was displayed, each root sewn with silk to its silken wrapper. Taking up a piece, and requesting his visitors not to breathe upon it, nor handle it, he would dilate upon the many merits of the drug, and the numerous cures it had effected. The cover of the root, according to its value, was silk, either embroidered or plain, cotton, cloth, or paper. Some of the root was worth not more than 6 to 12 dollars an ounce: other portions rose in the price to the most expensive, which was of the enormous value of 300 and even 400 dollars an ounce. This latter the merchant prizes of course very highly, and allowed only a glance at it, as he said it might be injured by exposure to the air. The inspection finished, each root was carefully returned to its place in the box, and this to its position on the lime; the parcels of the latter were readjusted, and the outer box locked."

So great was the demand for ginseng at one time amongst the Chinese for their home consumption, that the Americans endeavoured to establish a trade with China in the root of the North American plant—*Panax quinquefolium*. The Chinese, however, did not value it as they did their own product, and it was consequently abandoned. At the present time the true ginseng is not thought so highly of as formerly; but so late as 1859 a scientific expedition was organized in St. Petersburg to explore and report on the Mantchou territory and the frontiers of Corea, and to examine specially the ginseng, and the Chinese plantations, with a view of establishing plantations in Russia for the purpose of trading with China.

PHARMACY.

PART III.

PHARMACY.

Rhamnus Frangula versus Rhamnus Cathartica. C. Umney. (*Pharm. Journ.*, 3rd series, v., 21.) In the author's opinion *Rhamnus cathartica* might be advantageously superseded by *Rhamnus frangula*. He does not dispute the purgative properties of the former, but shows that the manufacture of the juice and syrup of buckthorn is and has been of a most suspicious and unsatisfactory character. The berries are not plentiful, and as the expression of their juice is, as a rule, not carried on by pharmacists, berries which do not possess the four-celled and four-seeded characteristic of *Rhamnus cathartica*, are likely to be used occasionally. The simplers and others who collect the berries prefer to supply the juice (?) as expressed by themselves, rather than to dispose of the ripe berries. No description is given in the B. P. of the characters by which this juice can be distinguished from spurious liquids resembling it, probably because the compilers had no opportunity of examining an authentic specimen. How very desirable, however, such a description would be is seen from the fact that it is difficult to find a specimen of the purchased fresh juice that will compare with that expressed by oneself. The author has never been successful during the past ten years in satisfying himself that from two to five volumes of water had not been added in the several trade specimens he has examined.

His own observation shows that ripe buckthorn berries, when expressed in the early autumn, will produce about 45 to 50 per cent. of juice, which has the following characters when freshly prepared:—Sp. gr. 1·070 to 1·080; of a green colour, which gradually changes into red, on account of the acidification of the mucilaginous and saccharine matters, of which considerable quantities are present, accompanied by a copious deposition of an inulin (?) like substance.

After the lapse of a year, the specific gravity will have decreased, on account of this change, to about 1·035.

A recent examination of trade specimens gave the following results, and indicated that the same sophistication is still going on, which has been common for years past.

Succus Rhamni, of trade (1874).

		Sp. gr.
1	. . . . .	1.005
2	. . . . .	1.004
3	. . . . .	1.007
4	. . . . .	1.007
5	. . . (true juice)	1.075
6	. . . (true juice, 1 year old)	1.035

These specific gravities indicate that water is the chief ingredient in the succus rhamni of trade, and that deductions from above figures would point to a ratio of about six parts of it to one of true juice.

In buckthorn syrup the juice is so disguised by the spices and sugar that it is no easy matter to speak authoritatively upon the genuineness of a specimen.

Any one, however, who has had an opportunity of preparing a syrup direct from the berries, cannot fail to identify a spurious preparation.

Of course it must follow that, if true buckthorn juice is such a rara avis, so also is buckthorn syrup.

To remedy this unsatisfactory state of things the author suggests the rejection of *Rhamnus cathartica*.

The *Rhamnus frangula* bark enumerated in the materia medica of recent German and other Pharmacopœias, although somewhat a novelty in this country, still has been experimented upon by Baildon, Giles, and others, and is said to be a most valuable aperient. This bark can be easily procured at all seasons, is most easy of manipulation, and from it a syrup (if there must be a syrup) can be easily made.

Having experimented, with a view to prepare an elegant and reliable liquid preparation of *Rhamnus frangula* bark, Mr. Umney is of opinion that a fluid extract containing an equivalent of one dram of the bark in one fluid dram, would be most acceptable.

Percolation of the finely-powdered bark by dilute alcohol, with a *modus operandi* similar to that of the United States Pharmacopœia for fluid extracts, produces a preparation elegant in appearance, but open to one objection, viz., the precipitation of much resinous matter upon dilution with water.

Decoction and subsequent evaporation to the required bulk, seem to be best adapted for the production of a concentrated fluid extract that shall be miscible with water in all proportions. Thus—

Fluid Extract of the Bark of Rhamnus Frangula.

(3j. = 3j. fl.)

R	Bruised Bark of Rhamnus Frangula .	1 pound.
	Alcohol (.838) .	4 fl. ozs.
	Distilled Water .	q. s.

Boil the bark in three or four successive portions of water until exhausted. Evaporate the decoctions by the aid of a water bath to twelve fluid ounces, or a sufficiency, so that the product to which the spirit has been previously added, shall, when filtered, measure sixteen fluid ounces.

For a syrup, if such a preparation be desirable, the following formula is suggested:—

Syrup of Rhamnus Frangula.

(10 grs. to 3j. fl.)

R	Bruised Bark of Rhamnus Frangula .	3 oz. 287 grs.
	Sugar .	1 pound.
	Water .	a sufficiency.

Boil the bark in successive portions of water until exhausted. Evaporate the decoctions by a water bath to ten fluid ounces or a sufficiency, so that the solution shall, when the sugar has been dissolved in it by a gentle heat, finally measure one pint, or weigh one pound ten and a half ounces. (Sp. gr. 1.320.)

Extract and Fluid Extract of Guarana, with General Remarks on the Manufacture of Medicinal Extracts. J. B. Moore. (*Amer. Journ. Pharm.*, 4th series, iv., 498; *Pharm. Journ.*, 3rd series, v., 462.) *Paullinia* has, within the last few years, attained considerable local popularity, and has been extensively prescribed in some parts of the United States.

Physicians, however, appear to be unsettled, not only in regard to its physiological action and therapeutic application, but also in regard to the dose in which it should be administered. Upon inquiry among his medical friends who have used guarana in practice, the author received very conflicting reports of its therapeutic value. While some extolled it highly, others condemned it as worthless and almost inert. Unfortunately, physicians frequently make a great mistake in their experiments to test the effects of a remedy, and to ascertain its true physiological action, by too often prescribing the remedy under trial associated with other active medicinal agents, effects being often credited to the new remedy that are due to those with which it is associated. To judge with any degree of accuracy,

of the effect of a remedy, it should be prescribed alone or with comparatively inert substances.

The author had occasionally received prescriptions for it in powder, for the last two or three years, but it was not until recently that he had it prescribed in the form of fluid extract; and not having any of the latter on hand, and knowing of no published formula by which to make it, he concluded it would be well to devise a formula and process for its preparation. The expensiveness of guarana, however, made it rather an uninviting subject for experiment; but as he was fortunate in his first conception of its character, and the proper strength of menstruum required for its exhaustion, he encountered but little difficulty in framing what he considers to be a suitable formula, as follows:—

R	Pulv. Paulliniæ	. . . . .	. ʒxvj. troy.
	Alcohol. Fort.,		
	Aquæ	. . . . .	aa q. s.

Mix three measures of stronger alcohol with one of water, moisten the powder with the menstruum, and pack it in a glass funnel prepared for percolation, and gradually pour the menstruum upon it until one pint of tincture is obtained. Set this aside in a shallow vessel to evaporate spontaneously to twelve fluid ounces; continue the percolation with the same menstruum until two pints more of the tincture are obtained, or until the powder is exhausted. Evaporate this portion by means of a water bath, at a temperature not exceeding 140°, to four fluid ounces. Mix this with the reserved tincture, and filter through paper.

This formula is stated to yield a perfectly reliable preparation, which is transparent, of a deep reddish brown colour (almost identical in appearance with the fluid extract of gentian), with a bitter, astringent, not unpleasant taste, leaving an after-taste on the palate strongly resembling that of coffee. The menstruum employed in the above process is found to thoroughly exhaust the drug of its virtues, and the proportion of spirit retained in the finished product holds in perfect solution all its soluble active matter. A sample of this fluid extract, made over three months remained still in excellent condition, showing no signs of change, and entirely free from deposit.

In an emergency a solid extract of guarana may be made by carefully concentrating the fluid extract, by means of a water-bath, to the proper consistence. But as this medicine is likely to be often prescribed in the form of pills, a definite formula and process for making a solid extract would be preferable. The author therefore

offers the following, which he says affords an excellent solid extract of the drug unimpaired by the process of preparation, if the directions given for its manufacture be observed :—

R	Pulv. Paulliniæ	.	.	.	.	.	3xvj. troy.
	Glycerinæ	.	.	.	.	.	f 3ss.
	Alcohol. Fort.,						
	Aquæ	.	.	.	.	.	āā q. s.

Mix three measures of stronger alcohol with one of water, moisten the powder with the menstruum, pack it in a glass funnel prepared for percolation, and gradually pour the menstruum upon it until one pint of tincture is obtained. Set this aside in a shallow, open vessel in a warm place. Continue the percolation with the same menstruum until two pints more of tincture are obtained, or until the drug is exhausted. Evaporate this by means of a water bath, at a temperature not exceeding 140°, to a syrupy consistence. To this add the reserved portion and the glycerin, and continue the evaporation at a temperature not exceeding 120°, until the whole is reduced to the proper consistence. During the concentration, in making this extract, the liquid should be stirred almost constantly, and especially is this necessary at the close of the process.

The author appends the following remarks on the manufacture of extracts :—

In the manufacture of all extracts, both solid and fluid, the important precaution of stirring during the evaporation should be observed, as it is by the neglect of this that the products in such cases are so often injured by heat. When it is observed, the concentration proceeds more rapidly and satisfactorily, and the medicinal virtues of the drug under treatment enjoy a comparative immunity from the injurious influences of heat.

In making fluid extracts, when reserved portions are to be concentrated to a given point, by either artificial or spontaneous evaporation, preparatory to receiving the product of the remainder of the percolate, it is very important to see that the concentration does not proceed too far. The evaporation should be closely watched, and the moment it has reached the desired point, the liquid should at once be transferred to a bottle, and tightly corked, to await the product of the remainder of the process. The neglect of this apparently trifling point is often the cause of entire failure, or at least of great inconvenience, and not unfrequently leads to the production of imperfect and faulty preparations; as, owing to the uncertainty of the composition of the liquid after evaporation

has once been permitted, its loss cannot be supplied with any degree of accuracy, especially when it is a liquid of a compound nature. Formulæ are in this way sometimes blamed for imperfections when it is the carelessness or inattention of the operator that is at fault.

Much care is also necessary in the concentration of the *last* portion of the percolate in making fluid extracts; where the liquid to be evaporated is a simple, as water, ether, chloroform, etc., the same care is not requisite to guard against excessive concentration, as the loss, in such cases, may be supplied by the addition of fresh portions of the respective liquids. Nor is it so important even when alcohol is the liquid under treatment, if, in the operation, *all* the alcohol is supposed to be expelled, because then water may be used to make up the loss, but if the spirit is to be only partially driven off, then care is absolutely necessary, for reasons above stated.

If the attempt be made, under such circumstances, to supply the waste occasioned by excessive evaporation, it may be the means of causing precipitation or other untoward result, when this portion of the percolate is added to the reserved portion. It is the object of the suggestions offered in this paper to impress indelibly, if possible, upon the minds of all inexperienced pharmacists the importance of these little points that are so essential to success in all pharmaceutical manipulations, yet which are so often overlooked, both by writers and teachers.

When a hydro-alcoholic liquid is to be evaporated, and it is important that all the spirituous portion should be expelled, this will be only imperfectly accomplished if the liquid is not diligently stirred. The agitation throws fresh portions of the liquid constantly to the surface, and thus favours the liberation of the alcohol.

By the above process the author obtained from 960 grains of powdered guarana, 330 grains of extract of a good pill consistence, which is about one third, or 33 per cent. of its weight.

This yield was the result of a carefully conducted experiment, in which no glycerin was used; although he does not think that the presence of the glycerin would influence the result much, as it simply takes the place of the water that would otherwise be retained in the extract to give it consistence. This small proportion of glycerin, he thinks, will be sufficient to preserve the extract in good pill consistence for an almost indefinite period. He has a sample of extract of gelsemium, made in January, 1869, and another of extract of opium, made about eighteen months ago, to which was added

about the same proportion of glycerin, and these extracts at the time of writing were in as good condition as when first made.

Mr. Moore is of opinion that pharmacists would find that the addition of from five to ten per cent. of glycerin to all extracts prone to harden in keeping, would save them the annoyance so frequently experienced in dispensing from this cause. He has been in the habit, also, of incorporating a small portion of glycerin with blue mass just when it begins to stiffen and become inconvenient for forming into pills; he adds just enough to restore it to a good pill condition.

In the United States Dispensatory, page 1670, edition 1870, guarana is directed to be given in substance, in the dose of from one to two drams, while of the extract only from eight to ten grains are directed to be given *during the day*, in pill form. Here there seems to be a great and unaccountable disparity of dose between the extract and the powder. Either the dose of the powder is unnecessarily large or that of the extract is much too small. The dose in which the powder is directed, the author thinks, is no doubt excessive, and that the proper dose of guarana, in substance, would be from fifteen to thirty grains. Taking this as a basis, the dose of the fluid extract would be from fifteen minims to a half fluid dram, or from about twenty-three to forty-five drops, as a fluid dram was found to contain about ninety drops, as dropped from the lip of an ordinary six-ounce prescription bottle; while the dose of the solid extract would be from five to ten grains, to be repeated every two, three, or four hours, or three or four times a day, according to circumstances.

The fluid extract of guarana is most agreeably administered mixed with simple syrup or the syrup of orange, in the proportion of from fifteen to thirty drops to a dessert-spoonful of the vehicle.

In the treatment of various nervous affections, headaches, etc., Mr. Moore thinks it probable that bromide of potassium, valerianate of ammonium, hydrate of chloral, valerian, morphia, belladonna, hyoscyamus, and tincture of hops will be found to be its best adjuncts and most eligible associates in a prescription.

As syrup seems to be so pleasant a vehicle for guarana, a syrup of guarana would probably be a very desirable and useful preparation of the drug, and Mr. Moore is about commencing some experiments with the view of framing a suitable formula for such a preparation. The dose of guarana in substance is so large, and it requires so strongly alcoholic a menstruum for the solution of its active principle, that the proportion of spirit in a tincture would

possibly be objectionable, and would be injurious, therapeutically, in the class of diseases in which guarana would be likely to be most generally employed.

Percolation. J. B. Moore. (*Amer. Journ. Pharm.*, 4th series, iv., 505.) The powder, after being moistened for percolation, should be passed through a sieve previously to packing, in order to break up any little lumps or aggregations that may be formed by the moisture. The sieve not only finely and uniformly divides the powder again, and restores it to the *most perfect* condition for packing, but it also removes any portions that are imperfectly powdered or any accidental impurities.

Any one who has never tried this plan will be surprised at its advantages, and will sometimes be astonished at what the sieve will remove from powders that were apparently perfectly uniform and pure. Of course, the sieve employed for this purpose must not be too fine. For powders ranging from No. 40 to 80, about a No. 20 sieve will answer, and for coarser powders a coarser sieve in proportion.

Inexperienced operators are recommended in percolating powdered substances with which they are not familiar, or have not treated for some time, first to moisten only a small portion of the powder, pack it according to their best judgment, and pour upon it a small portion of the menstruum, just sufficient to see how it enters the powder. The unabsorbed portion should then be returned to the remainder of the menstruum, and the moistened powder should be returned to the remainder of the powder, and thoroughly mixed with it before the addition of more menstruum. By this means a correct idea can generally be formed how the whole of the powder should be packed. It is important, however, not to take too much of the powder for these experimental trials, or the moisture absorbed by it may make the reserved portion of the powder, when mixed with it, too moist for correct packing. This simple expedient may often save the operator much vexation, and even *entire failure*, in important operations in making fluid extracts.

Many pharmacists are in the habit of using a stick or other instrument with which to stir the powder as the menstruum is added, as though contact with the substance would prove fatal. By this dainty method of manipulation, powders are often very irregularly and imperfectly moistened, and a much longer time is consumed in the operation than would otherwise be required, resulting, in hot weather, in a considerable loss of menstruum by evaporation. In this way, too, the powder is often left full of lumps or masses, with

some portions too moist, others too dry, and the whole in a bad condition for packing. The fastidious man who is afraid of soiling his hands in the legitimate operations of the laboratory or the dispensing counter, would be quite as likely to make a good blacksmith as a good pharmacist. This is rather a homely simile, but it is nevertheless a very expressive one.

It is one of the essential points in successful percolation to have the powder in just the right condition for packing, both as regards state of moisture as well as state of division. This can be most thoroughly and satisfactorily accomplished by rubbing the powder between the hands, as the moisture is added, and working it not unlike the practical housewife does her flour in the first part of the process in making bread. This thorough intermixing and rubbing uniformly and equally distributes the moisture, and also, in a measure, breaks up the lumps and little aggregations which often form in such powders when moistened. It is only by means of this kind of treatment, and the subsequent use of the sieve, as recommended above, that powders can be brought to that perfectly uniform condition so essential for correct packing for percolation.

When operating with substances which contain much colouring matter, such as the cinchonas, red saunders, etc., it will be well for the operator to wear a pair of india-rubber gloves, which will be found exceedingly useful to protect the hands in many operations of the laboratory.

In packing the powder in the percolator, the author, when practicable, always uses the back of his fingers held firmly together; he can thus, by direct touch, know how much pressure he is using, and can regulate it with greater accuracy.

In packing, special attention should be given to the quantity of powder that is added to the percolator at a time, as well as to the amount of pressure used. In all ordinary operations the powder should be packed in small portions at a time, in strata of not more than from a quarter to a half inch in thickness. Many operators are in the habit of introducing the whole of the powder into the percolator at once, which is a great mistake, as then the mass receives the maximum of pressure at the very point at which it should receive the least, and that is at the top.

For several years the author has adopted the plan, especially when operating with a large quantity of any substance, to gradually diminish the pressure in packing as he nears the top, as it is the lower portions of the powder that are likely to escape thorough exhaustion. The upper portions have always the advantage of con-

tact with the menstruum before its solvent power has become enfeebled, as it gradually does in its descent, so that when it reaches the extreme lower portions of the mass this power is almost entirely exhausted.

In cases where a preliminary maceration is considered necessary, and especially when the substance under treatment is of a tough, compact, and impenetrable nature, it is recommended that that portion of the menstruum with which the powder is moistened be previously heated, which can be easily done in a few minutes in a stone or tin vessel, or in a bottle tightly corked, and placed in a water bath. The maceration should also be conducted in a warm place.

The power of heat to expand vegetable tissue when moist, and to augment the power and energy of solvents, is well known; by its aid, when judiciously managed, the pharmacist may, in his manipulations, often greatly shorten tedious and lengthened processes.

It will generally be found necessary to moisten powders that are intended for preliminary maceration more than those intended for immediate percolation; otherwise they are apt, during the process, to become too dry for packing without afterwards being remoistened.

Preparation of Absolute Alcohol. J. L. Smith. (From the *American Chemist*.) In the process generally employed for the preparation of absolute alcohol in chemical laboratories, strong alcohol is poured on lumps of lime until the latter are covered. This method gives a thick magma which, when heated over a water bath, allows the alcohol to pass over but slowly, and causes much loss of alcohol from the impossibility of the heat penetrating the thick mass. To remedy this the author uses the smallest quantity of lime necessary to abstract all the water, taking care that the lime (in coarse powder) is kept in contact with the spirit sufficiently long to ensure the attainment of this object. To one litre and a half of the strongest alcohol of commerce (94 per cent.) contained in a two-litre bottle, he adds 180 grams of powdered fresh-burnt lime, and shakes the mixture frequently. After ten days the lime is allowed to settle, and the clear alcohol is drawn off. Its strength is now 98 per cent., and as it contains no more than half a milligram of lime dissolved in 50 c.c., it may be used for many purposes in that state. If required quite pure it can be readily distilled over a water bath.

When absolute alcohol is desired, the clear decanted alcohol of 98 per cent. is placed into a flask with the addition of 120 grams of lime in coarse powder, and connected with an inverted Liebig's condenser, so that the condensed alcohol runs back into the flask.

After heating in this manner for two hours, the condenser is placed in its normal position, when pure alcohol of 100 per cent. will pass over.

Copaiba Capsules. G. L. Ulex. (*Archiv der Pharmacie*, 1874, ii., 523.) The author draws attention to the occasional occurrence in pharmaceutical commerce of copaiba capsules, containing a mixture of copaiba and linseed oil instead of the pure article. The adulteration is readily detected by heating a few drops of the contents on a watch-glass to 110° to 120° C. for several hours. Pure copaiba thus treated leaves a transparent brittle resin; whereas the mixture alluded to leaves a soft tenacious residue, which, on heating, gives off the odour of boiling linseed oil. In one instance the author met with so-called copaiba capsules which proved to contain nothing but linseed oil.

Action of Bisulphide of Carbon on Benzoin, Tolu, Resins, and Gum-Resins. M. Guichard. (*Répertoire de Pharm.*, 1874.) By acting upon benzoin with bisulphide of carbon, and allowing the solution to stand for a long time, the author obtained fine large crystals, which he at first believed to be benzoic acid (see *Répertoire de Pharm.*, i., 275; and *Year-Book of Pharmacy*, 1873, 191), but which upon a subsequent examination he found to consist of benzoic acid and cinnamic acid. These two acids are thus proved to exist in benzoin in a free state.

From balsam of tolu he obtained crystals of cinnamic acid by the same treatment.

Most of the resins are readily soluble in bisulphide of carbon, and may be regained from the solution in a purified condition on removing the solvent by distillation. As an example, it may be stated that for the solution and purification of 500 grams of elemi, 300 to 400 c.c. of bisulphide of carbon will be required.

The gum-resins are of course only partially soluble in bisulphide of carbon, and leave a yellowish white residue, forming with water a milky emulsion, which passes completely through a filter. The author proposes to purify gum-resins by treating them with bisulphide of carbon, emulsifying the insoluble residue with water, filtering, uniting the two liquids, and evaporating. The bisulphide of carbon is of course regained by distillation.

Opium Testing. C. Arnoldi. (*Journ. Chem. Soc.*; from *Chem. Centr.*, 1874, 54.) The author's method is as follows: 500 grams of dry opium are digested in three ounces of distilled water for 24 hours; the liquid is poured through a weighed filter, and the insoluble part again similarly digested. The insoluble part is then collected

on the filter, washed with water so long as the washings are coloured, dried, and weighed. Good opium should not leave more than 200 grams of insoluble residue. The solution is concentrated to five ounces, filtered, shaken with bone-char, and again filtered; to the liquid a slight excess of ammonia is now added, whereby a precipitate of impure morphine is obtained; and this precipitate, after warming to expel excess of ammonia, is collected and weighed. Good opium yields 14.19 per cent. of impure morphine.

Aconitine by Different Processes. (*Chem. and Drug.*, 1875, 7; from the *Pharmaceutische Zeitung*.) As is well known, the method of obtaining aconitine differs with the authority to which reference is made. Aconitine by Hottot, of Paris, is far more active than that of German and English manufacturers, and it has hitherto been sought to explain the reason of this peculiarity partly by the habitat and country of *A. Napellus*, and partly by the process adopted for the preparation of the alkaloid. There is little doubt that the true reason lies in the water retained by the aconitine. Aconitine is an amorphous substance, which, when dried on the water bath, retains no water, but can easily enclose over 20 per cent. without being damp. In a body so active as aconitine, the difference caused by water so held must of necessity be very great. According to this, only an aconitine dried on the *water bath* should be officinal, seeing that the water retained will always vary with the degree of dry heat employed. The maximum dose of dry aconitine might then be reduced to .003 gram.

The Purity of Chloroform. (*Archiv der Pharm.*, October, 1874, 313; *Chem. and Drug.*, 1875, 78.) The substitution of grain spirit for pure spirit of wine appears to be the principal cause of the bad quality of certain commercial chloroforms. M. Rump has had the opportunity of rectifying large quantities of chloroform from various sources; one sample came from a manufactory in Saxony, another, in very good condition, from a dépôt established during the war of 1870. This chloroform was submitted to fractional distillation, and each tenth part separated. The last pound collected boiled between 72° and 82° C.

The liquid commenced boiling between 59° and 59.5°; the product ($D = 1.480$ to 1.481) was shaken with water to free it from alcohol, then dehydrated by chloride of calcium. After this treatment the product appeared pure; density 1.499. When the boiling point reached 60° the receiver was changed, and the temperature rose slowly to 60.75°. The fractionation of the products gave perfectly pure chloroform boiling at 60.5°, under a pressure of 760

millimetres. Further distillation separated products boiling between 61° and 62° , which consisted mainly of impurities. Their odour suggested amylic and butyric compounds, and recalled the smell perceived when chlorine or chloride of lime acts on animal substances. One sample of commercial chloroform, origin unknown, submitted to the same treatment, gave an odour of acetic ether. No sort of solid chlorine compound could be obtained from any of these products. The dense liquids arising from these different chloroforms were distilled over alcoholic potash. There was effervescence, and the density of the products rose to 1.51, and the boiling point to 70° . A very small quantity of alcohol sensibly lowered the boiling point. Mr. Schacht has proved the stability of pure chloroform *in vacuo*, even when exposed to sunlight. But under ordinary conditions the air has a manifest influence on chloroform; moisture renders its decomposition possible even in the dark. Chlor-oxy-carbonic gas is one of the products of distillation. M. Rump considers water to be the most active agent in the decomposition of chloroform. The alcohol contained in nearly all commercial chloroforms opposes this destructive action of water. He recommends that chloroform should be kept in glass bottles perfectly dry and clean. Chloroform containing $\frac{1}{8}$ per cent. of alcohol, and kept in the sun for two weeks, was less affected than some containing $\frac{1}{4}$ to $\frac{1}{2}$ per cent. of alcohol. The addition of $\frac{1}{8}$ per cent. of alcohol to chloroform lowered its density 0.002. Chloroform which has suffered decomposition rapidly decolourises sunflower paper; this is, therefore, a good test of its condition. In evaporating pure chloroform by heat from a one per cent. solution of nitrate of silver, the latter remains clear; if impure, it becomes more or less turbid, from formation of chloride of silver. The unpleasantly smelling products which impair the quality of chloroform and raise its boiling point, originate in the bodies foreign to pure alcohol produced by the distillation of grain. These facilitate the decomposition of chloroform, and cause the cough which troubles those who work with it. The rule should be to employ no alcohol charged with amylic bodies.

Notes on Aloin. Dr. Rochleder. (*Ber. der kaiserl. Akadem. der Wissenschaften, Wien*, 1874, 116; *Pharm. Journ.*, 3rd series, v., 23.) The author describes the results of some investigations which have been made in the laboratory under his charge, respecting the principles of aloes.

Dr. E. von Sommaruga has examined some aloin prepared from socotrine aloes. This aloin is not a glucoside, and differs from

nataloin and the aloin from Barbadoes aloes. The melting point of socotrine aloin lies between 118° and 120° C.; *i.e.*, the aloin softens at that temperature, while the melting point of aloin from Barbadoes aloes is given at 150° C. The socotrine aloin is also much less soluble in ether than Barbadoes aloes.

Stenhouse found the composition of Barbadoes aloin could be represented by the formula $C_{17}H_{18}O_7$. The figures obtained by the analysis of socotrine aloin answer to the formula $C_{15}H_{16}O_7$. Nataloin, according to Tilden, has a composition represented by the formula $C_{25}H_{28}O_{11}$, and the acetyl derivative is $C_{25}(C_2H_3O)_6H_{22}O_{11}$, or $C_{37}H_{40}O_{17}$. But the formula $C_{16}H_{18}O_7$ affords nearly the same percentage composition as $C_{25}H_{28}O_{11}$, and the formula $C_{24}H_{26}O_{11}$, or $C_{16}(C_2H_3O)_4H_{14}O_7$, has a percentage composition similar to $C_{37}H_{40}O_{17}$. The figures which Stenhouse obtained with the aloin discovered by Smith in Barbadoes aloes agrees with the formula $C_{17}H_{20}O_7$, equally as well as with $C_{17}H_{18}O_7$. It therefore appears highly probable that the three aloins may be represented as follows :—

Barbadoes Aloin	$C_{17}H_{20}O_7$.
Natal Aloin	$C_{16}H_{18}O_7$.
Socotrine Aloin	$C_{15}H_{16}O_7$.

and that they form the members of a homologous series which is deserving of closer investigation.

When melted with potash, as pointed out by Tilden, nataloin yields paraoxybenzoic acid and β orcin ($C_8H_{10}O_2$). The orcin ($C_7H_8O_2$) which, together with parabenzoic acid, Hlaziwetz obtained by the melting of socotrine aloes with potash, evidently originated with socotrine aloin. Barbadoes aloin gives with nitric acid, as has been before stated, chrysammic acid, besides oxalic and picric acids; nataloin, only oxalic and picric acids, and no chrysammic acid. The aloin from socotrine aloes gave, when treated with nitric acid, oxalic and aloetic acids. Socotrine aloes treated with nitric acid yields chrysammic acid, besides aloetic and oxalic acids, Chrysammic acid has been thus obtained in a hitherto unknown degree of purity; not as a golden coloured powder, but in golden coloured needles. Their composition was found to answer to the formula of tetranitrodioxyanthrachinone.

The action of bichromate of potash and sulphuric acid upon socotrine aloin gives rise to a substance similar to the purpurin of Krapp. A description of the method of preparing aloetic and chrysammic acids, their properties, substitution, and decomposition

products and combinations, is to form the subject of a special communication.

Notes on Aloes. Dr. W. Craig, F.R.S.E. (Abstract of a paper read at a meeting of the North British Branch of the Pharmaceutical Society, March 26, 1875.) In an elaborate report on *aloes* with special reference to the action of *changed aloin* and the *resin of aloes*, the author arrives at the following conclusion, as the result of his researches.

1. Aloin may, by exposure to the air, undergo considerable chemical change without losing its physiological action as an active aperient.

2. The resin of aloes, when thoroughly exhausted of aloin, possesses no purgative properties, and therefore cannot be the active principle of aloes.

3. The resin of aloes is not the cause of the griping which sometimes follows the administration of the drug; it is a perfectly inert and harmless substance.

4. Aloin is an active aperient, and in all probability the only active principle of aloes.

He regrets that in the addendum to the B. P. published in 1874, no mention is made of aloin. It ought to find a place among the officinal medicines, as it possesses the following advantages over the crude drug.

1. Being uniform in strength, its dose can be more accurately determined.

2. Its dose being only half a grain to one grain, it can easily be introduced into tonic pills without making these pills too large.

3. By using the active principle all impurities are excluded which are apt to cause griping.

Its uniformity in strength, the smallness of its dose, and the certainty of its action, should commend it to the favourable consideration of all medical practitioners. The author considers the following pill superior to the *pil. ferri et aloes* of the B. P.

R. Aloin	gr. ss.
Ferri Sulph. Exsic.	gr. ss.
Extract. Nuc. Vom.	gr. jss.
Extract. Bellad.	gr. ss. Ft. pil.
One or two pills daily.	

This he has found an excellent pill for the constipation so common in females of a sedentary habit.

Oil from Nux Vomica. Charles Bullock. (*Amer. Journ. Pharm.*, iv., 405.) In the preparation of extract of nux vomica,

with the intention of having the extract sufficiently hard to permit of pulverization, the hardening process was conducted in a porcelain vessel heated by a steam jacket. As the extract solidified each night on cooling, the oily matter rose to the surface, and was removed before reheating. From 150 pounds of nux vomica five pints of oil were obtained.

To ascertain whether this oil contained any notable portion of the alkaloids of nux vomica, four fluid ounces of the oil was agitated with water acidulated with sulphuric acid; the water was allowed to separate by long standing, and then removed. The process of washing was repeated as long as the washings were precipitated by a solution of caustic soda.

On the addition of the soda solution in slight excess immediate precipitation occurred; the precipitate on stirring aggregated into a waxlike mass; at the end of twenty-four hours the solution was filled with a copious gelatinous deposit. Both precipitates were collected on a filter, washed to remove the excess of alkali, and treated with water acidulated with sulphuric acid until exhausted. The acid solution was neutralized with soda, the alkaloids collected on a filter, dried, and dissolved in hot dilute alcohol. The alcoholic solution yielded 10.6 grains of alkaloids.

The presence of strychnia was shown by the characteristic violet colour, when treated with sulphuric acid and chromate of potassium; but as the alkaloids dissolved *almost* completely in warm absolute alcohol, strychnia could only be present in small quantity, the major part being brucia.

The gelatinous matter when dry weighed fourteen grains. Heated on platinum foil it remained unchanged, and was sparingly soluble in hydrochloric acid. When boiled with a solution of pure carbonate of potassium, and the filtered solution neutralized with nitric acid, the addition of nitrate of barium produced no change (absence of sulphuric and phosphoric acids). The insoluble portion remained insoluble in dilute hydrochloric acid; the precipitate was, therefore, not a salt of the alkaline earths.

A *second* portion was fused with pure caustic soda, the fused mass dissolved completely in water. To a part, solution of chloride of ammonium was added, producing a copious flocculent precipitate, showing the base to be alumina. To the remaining portion of the soda solution, after super-saturation with nitric acid, solution of molybdate of ammonium was added; no reaction took place, even after long standing, showing the entire absence of phosphoric acid.

Prof. J. M. Maisch has noticed the presence of earthy phosphates

n nux vomica (*Amer. Journ. Pharm.*, xxxii., 524). In this instance, the phosphoric acid may have been removed by long digestion with dilute sulphuric acid, and subsequent precipitation by soda.

The presence of alkaloids in the oil shows the importance of Prof. Proctor's suggestion that, when the oil is removed, it should be agitated with a little dilute alcohol, which takes from it any adhering extractive matter.

The Influences of Heat on Preparations of Sarsaparilla. J. F. Judge. (*Proceedings of the American Pharm. Association.*) For the purpose of answering the query, whether sarsaparilla is altered in its sensible properties and injured in its medicinal qualities by the heat of a water or steam bath, proposed by the American Pharmaceutical Association, the author prepared a fluid extract by exhausting a good specimen of sarsaparilla with a mixture of five parts of alcohol of 92 per cent. and three parts of water.

One fluid ounce of this was evaporated to a thick pilular extract over a water bath, yielding sixty-three grains of extract of a brownish colour, and retaining the peculiar taste of the fluid extract.

Upon digesting this extract with two fluid ounces of a menstruum similar to that used originally in making the fluid extract, all except a mere trace was dissolved; hence the author concludes that in sensible properties, and probably also in its medicinal qualities, sarsaparilla is not injured by the heat of a water or steam bath.

Scammony and its Adulteration. A. F. Haselden, F.L.S. (*Pharm. Journ.*, 3rd series, v., 41.) Authors have stated that chalk, starch, gum, common resin, guaiacum, jalap resin, decoction of jalap, and of the leaves and twigs or villous stems of the scammony plant, senna, manna, gamboge, and ivory black, are used for the purpose of adulterating scammony.

The following form for making spurious scammony has been published as being followed by some dealers:—

Gum Scammony	6 pounds.
Gum Arabic	6 pounds.
Calomel	2 ounces.
Aleppo Scammony	1 pound.
Ivory Black and Water	q. s.

This is a very old formula, and it is not probable that any such system is followed now.

The author has never yet found common resin, guaiacum, or jalap resin in scammony. At the present time, obviously, jalap resin would

not be used, as it is dearer than scammony resin. Common resin and guaiacum are readily found if present. That there are several qualities of scammony or scammonium of the B. P. in the market there can be no question. Aleppo scammony is sold at various prices, from 18s. to 38s. per lb., and virgin scammony from 34s. to 44s. per lb., while the prices of resin of scammony vary from 13s. to 16s. per lb.

In the author's opinion the framers of the formulæ of the Pharmacopœia compounds in which scammony is employed have acted somewhat inconsistently. In the London Pharmacopœias, before the publication of the B. P., virgin scammony was invariably ordered. In 1864 a permission or discretion was placed in the hands of the compounder, in making extract. colocynth. co., to use either scammony or resin of scammony; in the B. P., 1867, resin of scammony alone is ordered, leaving no option; whilst in pilul. colocynth. comp. of both books, scammony, meaning virgin scammony, is required. It might be worth while to inquire into the cause of this apparent confliction, for that which seems good for the extract may be thought good for the pill, the confection, and the compound powder. Dr. F. J. Farre (*Pharm. Journ.*, 1st series, xviii., 452) considers the medicinal value of the resin of scammony as about equal to that of virgin scammony. Dr. Johnson also reports well of the resin, and Dr. A. B. Garrod states that the scammony from the untapped root is quite equal as a remedy to the very best virgin scammony met with in commerce, and equal in fact to the resin extracted from commercial scammony by means of ether. Being entirely free from the frauds practised upon the scammony of commerce, it is perfectly uniform in its physical characters, composition, and therapeutic action. The author himself sees no reason to alter his favourable opinion of the resin, and proposes that in the next edition of the B. P. resin of scammony should take the place of scammonium.

He also suggests that so long as the authorities require virgin scammony to be used, the best that can possibly be obtained be bought, as this practice alone would soon stop the admixtures abroad. He draws attention to the fact that the substitution of cheap scammony for the scammonium of the B. P. in the preparations contained in that book, or where scammony is ordered by prescribers, is virtually an adulteration. The B. P. states that from 80 to 90 per cent. of resin may be extracted by ether, but it would be unreasonable to expect that every pound in a chest taken out separately would yield that percentage, and therefore some margin should

be allowed in the examination of such a substance before it is condemned as being adulterated.

Note on the Behaviour of Certain Fluorescent Bodies in Castor Oil. Charles Horner. (*Philos. Mag.*, September, 1874.) Some colouring matters derived from woods, not showing any fluorescence when dissolved in water, alkaline solutions, alum, or alcohol, are found to exhibit this phenomenon on treatment with castor oil; whilst other substances, which fluoresce in alcohol, etc., are observed to show this property with augmented intensity.

To obtain clear solutions, the materials are first boiled in alcohol, filtered, evaporated to dryness, and then heated with the oil. On transferring some of the prepared solution to a test tube and reheating, the fluorescence disappears as the temperature approaches the boiling point, but returns on cooling. Moreover, this operation may be repeated without the substances suffering decomposition. Cudbear, camwood, logwood, and turmeric are selected as illustrations of the properties cited.

Cudbear yields a brilliant orange fluorescent light, and is visible in diffused daylight without the agency of a condensing lens, which is necessary to show it in an alcoholic solution.

Camwood exhibits a powerful apple-green fluorescence, although wholly destitute of this property in aqueous or alcoholic media. The spectrum of the fluorescent light is continuous from E downwards, interrupted by two narrow, faint shadings, situated at $3\frac{5}{8}$ and 5 of Sorby's scale.

With regard to logwood, unless the castor oil solution be saturated, sunlight and a lens are requisite to bring out its fluorescent character. The colour very much resembles that of camwood, but is distinguished by its spectrum, which is continuous from *b*, but interrupted by two shadings at $4\frac{1}{4}$ and $5\frac{3}{4}$.

Turmeric is well known to fluoresce powerfully, in alcohol a yellow-green, and in benzol a blue-green. In castor oil, however, the fluorescent light is at least three times as bright as in other fluids, and may be described as a vivid emerald-green, evident in the dullest daylight; but if a flat bottle of the solution be placed on black velvet behind rather deep cobalt glass, when the sun is shining, the phenomenon is of a most brilliant description, and without exaggeration may be compared to that produced by the beautiful uranium-glass. The spectrum furnished by the fluorescent light is characterized by transmission of red and green rays, and blue to F, with a faintly perceptible shading at the yellow end of the green.

These facts, therefore, show that in studying the phenomena of

fluorescence, advantage should be taken, whenever possible, of this valuable solvent property of castor oil.

Fluorescence as a means of Detecting Adulteration. Dr. C. R. C. Titchborne. (From the *Proceedings of the Royal Irish Academy*.) How well the fluorescence of any substance may be used for its detection in the presence of a non-fluorescent one, is illustrated by the author in reference to the examination of commercial mustard.

The seeds of the black or white mustard yield a yellow colouring matter, soluble in spirit of wine, which is devoid of fluorescence. Turmeric is always present in the inferior qualities of this condiment, because the actual adulterant is wheaten flour or rice, the turmeric being necessary to bring the white adulterant up to the same shade as the ground mustard seeds, therefore the samples vary from 0.5 per cent. to 0.05 per cent. of turmeric. Now, with such minute quantities of turmeric, the alkaline test is very unsatisfactory—in fact, all chemical reactions are unsatisfactory—when dealing with such a minimum of adulteration.

But the great elegance of this fluorescent test consists in the fact, that within reasonable limits, *the more dilute the solution the more strongly* does the fluorescence test come out. The non-fluorescence of the colouring matter of all substances that are adulterated with a fluorescent substance should, in the first instance, be exactly and scientifically determined. This is easily done by any one who has the necessary arrangements. In the case of the mustard yellow, Mr. H. Draper kindly examined it for the author by the light of the spark formed between two steel wires (such a spark being the best for the purpose).

The steel points were placed in connection with a four-inch intensity coil, and a small leyden jar was interposed in the circuit. The battery used consisted of three Groves' elements. In examining by this method, ordinary glass vessels must be discarded, because even the strongly marked fluorescence of turmeric is more or less masked by the blue fluorescence of the glass.

In a quartz cell (two plates of quartz in a frame of gutta percha) these observations can be carried on with the greatest accuracy. Mr. Draper's observations prove, that whilst the colouring matter of the true seeds gave no fluorescence, the presence of so small a quantity of turmeric as .005 per cent. could be readily detected.

Before we are justified, however, in using this phenomenon as the test for the presence of any substance, it is necessary to put it to a crucial examination, such as that detailed above, to find out how far

the particular substance under examination is capable of giving fluorescence. But it is not at all necessary that we should submit it to the light of a spark in the practical application of the test. The fluorescence of an ordinary white glass flask is not observable under the ordinary diffused light of a laboratory: but the ordinary fluorescent substances (so called) are easily recognized under such conditions. It is only necessary, therefore, to form a tincture of the substance to be examined. The observation of Mr. Horner (*Phil. Mag.*, September, 1874), who finds that fluorescence is wonderfully developed by castor oil, may be made use of with great advantage. A drop of castor oil that has been passed through adulterated mustard, upon a filter, appears green when dropped upon a black plate in ordinary daylight. If the mustard is pure, no coloration will be perceived. The author met with some specimens of "saffron" (the stigma and style of *Crocus sativus*) which give a fluorescence. They were evidently adulterated, because the flowers of saffron give no fluorescence. This saffron is a most expensive drug, and is therefore very liable to adulteration.

The Cohesion Figures of Oils as Tests for their Identity and Purity. Kate Crane. (*Amer. Journ. Pharm.*, iv., 406.) A number of experiments on this subject conducted by the authoress have led her to the conclusion that a little patient practice will teach the eye of the observer in a short time to detect the characteristic differences of the figures. To make these perfect it is necessary to observe the time in forming, for at *different periods* some varieties form figures very like; but with this precaution each is entirely characteristic. It is essential that the dish used, etc., be perfectly clean, so that when filled with water no dust or lint floats upon the surface, as this materially interferes with the perfect formation of the figure.

A single drop is let fall from a burette or glass rod held steadily above the water, upon the centre of the surface.

The following experiments were made with a number of volatile oils by themselves, and mixed in different proportions, with *oil of turpentine*.

The last-named oil, by itself, spreads instantly to the whole size of the plate, a common soup plate, and almost immediately the edge begins to break into irregular shapes, when a rapid motion takes place over the whole surface of the film, and there seems to be a contest between the cohesion of the oil particles and the adhesion between them and the water. The oil makes repeated efforts to gather itself closer together, when the water instantly reacts, giving

a wavy appearance to the whole figure. The play of colours at this point is beautiful, and serves to bring out the lines more perfectly. In a few seconds innumerable little holes appear over the surface, which soon are separated only by threaded lines, and the figure is like the most exquisitely fine lace.

Oil of cinnamon forms a figure not more than half the size of the last named. In a few seconds small portions are detached, and shortly separate into distinct drops, four or five larger and a number of smaller ones, scattered about. With mixtures in different proportions of *oil of turpentine*, the figures formed differently, taking more the characteristics of the adulterant as it predominated.

Oil of nutmeg forms a large figure instantly, the edge showing a beaded line. It gathers itself together and spreads again, very like oil of turpentine, but the surface presents more the appearance of watered silk. Within 60 seconds some holes appear, and in 80 more the surface is covered with them; these scarcely spread to more than a sixteenth of an inch in diameter, but from the first each is bordered with a dotted edge. The figure lasts some time without changing materially, except the openings lengthen out into an oblong shape, remaining entirely distinct. The play of colours is very fine. With the addition of one third the volume of *oil of turpentine*, the first spreading is little different, but openings appear in half the time, and the dotted border does not come as soon; in about four minutes the figure is most characteristically marked, and soon breaks up entirely, this being the distinctive difference between the pure oil and the mixture.

Oil of peppermint spreads instantly to a large figure, and in ten or fifteen seconds openings appear, which increase rapidly in size. At first they look somewhat like the last named, but are not nearly so numerous, and the border soon is more like tiny drops. In one and a half or two minutes they begin to run together, and the figure breaks up. With the addition of *turpentine oil* the figure forms more slowly, and the breaking up is less rapid, but in five minutes the outlines only remain.

Oil of bergamot spreads instantly; in thirty seconds tiny openings appear, not very abundant, and increase in size slowly; in five minutes they are not larger than oil of nutmeg at one and a half minutes. At first they have a dotted border, but as they increase in size this changes to a scalloped film, which spreads until, in eight or ten minutes, they are joined together over the whole surface. This, with *turpentine oil*, gives a watered surface in spreading, much more marked, and with a finer play of colours.

Experiments with fixed oils are as follows : *poppy-seed oil* spreads instantly to a large figure, retaining an entire outline, and for a few seconds the surface is unbroken, except the bare intimation of a beaded edge. In a few moments little holes appear round the edge, and soon the whole surface is broken in like manner ; these increase in size very slowly. In fifteen minutes the edge begins to open, forming indentations, which gradually work their way across the figure. As they increase in length these begin to curve, and in three quarters of an hour have doubled themselves two or three times.

Cod-liver oil spreads in a large film ; a little way from the edge a row of small holes appear, and in a minute or two the surface is covered with them ; these gradually enlarge, assuming irregular shapes, soon separated by branching lines.

Cod-liver oil with *lard oil* spreads very like the former, but in a few moments the edge opens and the film separates partly across ; in a moment one of the projecting points begins to curve itself towards the centre, bending more and more until it forms a coil. Meanwhile a few holes have appeared, which spread irregularly, throwing out projecting points.

Castor oil spreads instantly, the edge remaining entire ; openings appear quickly in thirty seconds, and increase gradually, but unevenly, those nearer the edge being larger, and lengthening out irregularly as they spread. The figure lasts some time. *Castor* with a little *lard oil* makes a smaller figure, and not nearly so much broken ; in five minutes the holes open into each other, and the figure breaks up from the edge.

A mixture of *castor* and *poppy-seed oils* spreads to form a lacework border, but smooths out to an entire edge soon, and within a few seconds openings appear. The figure in size and general appearance is more like *castor oil* alone, but the holes spread less uniformly in a given time, a few being larger, but the greater portion much smaller. In fifteen minutes there is a general tendency to break up.

Castor with a little *croton oil* throws out a spray, which in a few moments unites into a thin film. The spray, as it spreads, draws out the inner portion into radiate points, which open into a beautiful network, the centre cohering closely.

Croton oil throws out, in spreading, a fine spray in advance of the more closely cohering portion, which follows quickly. The outer edge breaks up unevenly into little indentations, the border of the inside portion being quite broken, but gradually becomes nearly entire. The surface, too, has openings, which increase quite rapidly

in size, the outer ones being much the larger. In the final breaking up, before the holes open one into another, the outlines are beautifully fringed.

Of many of the fixed oil figures the authoress obtained very nice patterns by Dr. Moffatt's method—dropping thin glazed paper upon the perfectly-formed figure for an instant, then pressing between blotting paper to absorb the surplus oil; or, to bring out the pattern more clearly, floating the paper upon a coloured liquid for a moment or too before pressing.

The Testing of Vegetable and Animal Oils. J. J. Coleman. (*Journ. of App. Chem.*, Dec., 1874.) The late Prof. Calvert constructed a table showing the result obtained by treating oils with acids and alkalies of various strengths. Twelve reagents were employed, and one hundred and eighty reactions and colours produced are given, which he had observed in experimenting on fifteen different oils. Cotton-seed oil and olein from tallow are omitted, as well as fifty others of minor importance.

Heidenreich, Penot, and Marchand, have also proposed colour tests from the reaction of pure sulphuric acid on oils, but, like those of Calvert, they are open to doubt and uncertainty, the coloration often depending on the accidental impurities of the oil.

There is a great difference in the amount of heat produced on mixing one part of sulphuric acid with three parts of oil; the gain in temperature is 100° where rape-seed oil is used, as compared with 68° when olive oil is experimented upon. A method based on this principle was suggested by Marmene and elaborated by Fehling; it is easy of execution and interesting in results.

The relative viscosities of the fatty oils are determined by the time required for a given quantity of each oil to flow from a pipette which is heated to 120° F. by being surrounded by a glass tube into which steam is passed. In an experiment, made by Mr. Coleman, German refined rape required $8\frac{1}{2}$ minutes, olive $8\frac{1}{4}$ minutes, tallow $7\frac{1}{2}$ minutes, lard oil 7 minutes, cotton-seed 7 minutes, sperm 5 minutes.

Spontaneous combustion ensues when a handful of cotton waste is imbued with oil and placed in an air bath at 130° to 200° F. Boiled linseed required $1\frac{1}{4}$ hour; raw linseed, 4 hours; lard oil, 4 hours; refined rape, about 9 hours. Mr. Gellatly found that an admixture of 20 per cent. of mineral oil retarded combustion, and 50 per cent. prevented it entirely.

There are three practical methods of judging of the drying properties of oils: 1. Nitrate of mercury, which indicates by the

consistency of the mass subjected to the reaction. Resin oil, mineral oil, and the drying oils proper, refuse to solidify. 2. Comparing a sample under examination, heated in a shallow capsule to 200° F., with a light quantity of oil known to be pure. 3. Imbuing thick white blotting paper with the oil under examination, and comparing by a similar experiment with oil known to be pure, say at a temperature of 150° or 200° for some hours, or at ordinary temperatures for some days.

The specific gravity of oils, when accurately determined, is of some consequence. To be of value it should be carefully taken at a temperature of 60° F. The oleometer should be marked with ordinary specific gravity degrees, water being 1000, and the space allowed on the stem for each degree should not be less than a tenth of an inch.

The presence of mineral and resin oils in a mixed oil must be the first point proved, and when it does exist, it increases the difficulty of testing, for there is no easy method of separating them without actual destruction of the fatty oils. Saponification is not efficient, for mineral oil unites with the soap produced, forming an emulsion which does not separate after standing for months. Perhaps a lime soap might be prepared, pulverized, and the hydrocarbon extracted by some volatile solvent, but the most satisfactory method would be an ultimate chemical analysis.

In practice, however, mineral oils can be easily detected by two characteristic tests: 1. The fluorescent properties they impart to all animal or vegetable oils. 2. The strongly marked aromatic burning flavour they communicate to mixtures containing them. The first-mentioned property is brought out by smearing a metallic surface, such as tin plate or steel, with the oil, and then viewing it at different angles in the open air or sunlight.

In examining a dark-coloured oil, it may first be necessary to refine the sample by successive treatments with concentrated sulphuric acid and weak soda solution or lime water. As small a quantity as $2\frac{1}{2}$ per cent. may then be detected by the bluish colour noticed on viewing the oil at certain angles and by tasting it.

The absence of resin oil must also be proved. Nitric acid is said to be a good test, as the colour developed is much greater than in pure oils. Sometimes it may be detected by the smell. The presence of 10 per cent. of resin or mineral oil in non-drying oils delays their solidification with the nitrate of mercury test.

Oils may be classified according to their commercial value. The

first class embraces only sperm oil. The tests recommended by Mr. Coleman, for adulterations in this oil are five in number :—

1. Examine for mineral oil.
2. Examine its drying properties by exposing some of the oil for some hours in a thin layer to 200° F.
3. Notice that other fish oils darken much more notably than sperm oil when shaken up with dilute sulphuric acid.
4. The most likely adulterant is African fish oil, which produces intense heat when mixed with concentrated sulphuric acid; thus, a mixture of 1 part of acid and 4 parts of oil develops about 112° of heat, against a development of upwards of 250° with African fish oil. African fish oil has a specific gravity of about 0·866, and is a very bad lubricant. Other adulterating oils may also be detected by this test.
5. As the use of sperm oil is dependent upon its viscosity, an accurate test thereof, in a suspected sample, may be useful.

Class II. comes next in value to sperm oil, viz., the oleins obtained by pressure from animal fats, known in the market as tallow olein, lard olein, and neatsfoot oil. Lard and tallow oils should have a specific gravity of 0·915. If the oil is heavier, it may contain fish oils, seed oils, olive oils or cocoa-nut olein. Olive oil, cocoa-nut oil, or fish oils can be detected by the smell, colour, taste, and Calvert's tests, so that the real difficulty lies with seed oils, one of which, rape oil, is nearly of the colour, and exactly of the specific gravity, of animal oleins. If a sample of animal olein be too heavy, it probably contains some partially drying oils like cotton seed, which range from ·920 to ·930. Those seed oils which cannot be detected by variations in the specific gravity are rape, henbane-seed, horse-chestnut, and plum-kernel oils. Of these the last three may be disregarded. The processes for the detection of rape oil are the following :—

1. Heating to 400° F., and allowing to cool to 90°. Tallow and lard oils are rendered odourless, while the peculiar penetrating smell of rape oil is developed.
2. One part, by weight, of the oil is mixed with three parts of concentrated sulphuric acid, and the heat developed is compared with that produced in a similar experiment made with pure oil.
3. The nitrate of mercury test is said to indicate the presence of 10 per cent. of the adulterant.

Finally, lard oil is distinguished from tallow olein by difference of viscosity.

Class III. embraces the olive oils. The adulterants to be

sought for are drying oils, fish oils, mineral and resin oils. The specific gravity of olive oil is 0.917. Rape oil would make it lighter, and cotton-seed oil heavier, but a proper mixture of the two could be adjusted exactly to the specific gravity of olive oil. Fish oils being proved absent by Calvert's tests or by the smell, the following tests are used for seed oils:—

1. The well-known nitrous acid or nitrate of mercury test.
2. The characteristics of the amides produced by liquid ammonia.
3. Fehling's test of the rise of the temperature produced by mixing with concentrated sulphuric acid.
4. The characteristics of the action of solution of carbonate of potash on the oil.

Class IV. Rape oils are the borderland between drying and non-drying oils, and are employed both for burning and lubricating. Their specific gravity varies from 0.912 to 0.916. They are likely to be adulterated with cotton-seed oil, which, however, increases the specific gravity (mineral and resin oils being proved absent); it also raises the freezing point of rape oil, which, when pure, is perfectly liquid at 32° F. The other tests applicable are those for estimating the drying properties of the oil, either by exposing on blotting paper or in small capsules to a temperature of 200° F.

Class V. is represented by linseed oil, the specific gravity of which is about 0.937 at 60° F. Mineral and resin oils must be carefully looked for, and, in their absence, fish oils are easily detected by smell or Calvert's tests. Cotton-seed oil may be recognized by the lower specific gravity, the higher point of solidification, and the decrease of the drying properties, which can be proved as above indicated.

Class VI. Fish oils have a commercial value inferior to the other oils, because of their odour; hence they are not much liable to adulteration. They may, however, be mixed with each other, some varieties being much cheaper than others. The points to be observed are, the possible presence of mineral and resin oil, the drying properties of the sample, and its viscosity.

Oleographs, or the figures formed by oils dropped on pure water, do not seem to have been studied by Coleman. With care and practice they may be made of considerable value in the testing of oils.

Estimation of Fixed Oil in Adulterated Citronelle. (*Chem. News*, xxx., 293.) The following method yields constant results when managed with care, and when taken in conjunction with the specific gravity of the sample may give a good approximation as to the quantity and the class of the adulterating oil.

a. Dissolve about one ounce of caustic potash in five ounces of alcohol in a flask; put on a sand bath, and leave to boil.

b. Tare an eight-ounce beaker, and weigh into it 400 to 500 grains of the citronelle; add two volumes of alcohol; boil on a sand bath.

c. When *a* and *b* are both boiling, add one volume of the alcoholic solution of potash to the three volumes of alcohol and citronelle. Boil for a minute or so, and then fill to within an inch of the top with distilled water. Stir gently, and let boil for half an hour, or until the upper layer is perfectly clear, and the under fluid semi-transparent. Then allow to cool.

d. When quite cold, siphon off the under-fluid (containing water, alcohol, and potash, and soap, if any fixed oil was in the sample) very carefully into another beaker, and boil gently. Acidify with dilute H_2SO_4 . Add 50 or 100 grains of wax, continue gently boiling till the oily layer is perfectly clear, and then allow to cool gradually.

e. When cold remove the cake of fat, dry, and weigh. The weight, less 50 or 100 grains of wax, is the amount of fatty acid contained in the fixed oil. A simple calculation will show the amount per cent. of the adulterant in the citronelle.

Antagonism between Sulphate of Atropia and Calabar Bean.
Dr. J. H. Bennett, F.R.S.E. (From the report of the committee of the British Medical Association; *Brit. Med. Journ.*, No. 719, 464.)
The following conclusions regarding the antagonism between sulphate of atropia and extract of Calabar bean are drawn from numerous experiments, the details of which are given in the original paper.

1. Sulphate of atropia antagonizes to a certain extent the fatal action of Calabar bean.

2. The area of antagonism is even more limited than Dr. Fraser has indicated in his paper.

In all the experiments made in connection with this branch of the inquiry, it was found that so-called antagonism existed within very narrow limits. The danger was, not death by too great a dose of sulphate of atropia, the supposed antagonist, but death from the effects of the extract of Calabar bean. In this respect, there was also a marked contrast to the action of hydrate of chloral on the physiological effects of strychnia. In the latter instance, the danger evidently would be, in a case of poisoning by strychnia, to give too large a dose of hydrate of chloral; whereas, in the case of poisoning by extract of Calabar bean, it would apparently be very difficult to arrest its effects by sulphate of atropia, because a small dose of the latter produces little effect (at all events in rabbits), and the effects

of the extract of Calabar bean are so violent as soon to destroy life. It results that, for all practical purposes, atropia, as an antidote to Calabar bean is useless, and not to be compared with the effects of chloral hydrate, as shown by the committee under the next head.

Antagonism between Hydrate of Chloral and Calabar Bean. Dr. J. H. Bennett. (From the Report of the Committee of the British Medical Association; *Brit. Med. Journ.*, No. 720, 485.) The experiments recorded show that if hydrate of chloral be given before extract of Calabar bean, so that the animal is deeply under the influence of hydrate of chloral before it receives the extract of Calabar bean, the symptoms of the latter are much modified, and life saved from the effects of what would otherwise be a fatal dose. On the other hand chloral hydrate is of comparatively little service as an antagonist to extract of Calabar bean if given some time after the latter. The reason of this is quite evident. Extract of Calabar bean produces its more severe physiological effects ten or twelve minutes after the administration of the fatal dose. In some cases the effects occur even sooner. On the other hand, a rabbit is not deeply under the influence of hydrate of chloral until fifteen or twenty minutes after it has been given. If the effects of extract of Calabar bean appear before those of hydrate of chloral, they usually run quickly to a fatal issue, because the antagonist, hydrate of chloral, is not acting with sufficient vigour to restrain them.

It comes to be considered what is the nature of the physiological antagonism between extract of Calabar bean and hydrate of chloral. Is it a true antagonism, a neutralization of the physiological effect of the one by that of the other? The effects of the one do not appear to be completely neutralized by those of the other. Even in those animals deeply under the influence of hydrate of chloral into which a fatal dose of extract of Calabar bean has been subsequently introduced, we do not find a complete absence of the symptoms referable to the presence of the extract of Calabar bean. There are still twitchings and startings, tremors, salivation, contracted pupil, etc. But, on the other hand, the tendency to death by convulsions is obviated. If the animal be kept quiet, with a free circulation of air around it, it may recover. Cases of death after the introduction of both substances are to be referred to pulmonary congestion and the accumulation of fluid in the air passages.

From these experiments, it is evident that in the action of chloral hydrate and extract of Calabar bean, we have a good example of physiological antagonism. This antagonism is, however, limited, as in all such cases, by two conditions: 1. *By the doses administered.*

More than a minimum fatal dose of extract of Calabar bean destroys life, notwithstanding the administration of chloral hydrate. 2. *By the interval of time between the administration of the two substances.* There is a great probability of saving life in those instances in which both substances are given almost simultaneously. This probability is diminished if the chloral hydrate be given five or eight minutes after the extract of Calabar bean; while there is no chance at all if the chloral hydrate be given more than eight minutes after a fatal dose of extract of Calabar bean. But even in those cases in which death occurs after the introduction of both substances, the effects of the Calabar bean are much less marked.

These results must be regarded as very important. Several cases are now on record where ships coming from Africa have discharged Calabar beans on the shore, which have been eaten by children with more or less poisonous effects. In such cases, the administration of chloral hydrate should at once be resorted to. In Africa, fatal doses are designedly given by the ignorant natives as a test of guilt or innocence; and it will be well to remember that there it may not unfrequently occur that, as civilisation opens up the country to our missionaries and medical men, life may in this way not unfrequently be saved.

Experiments conducted with the object of testing the value of Calabar bean as an antidote for morphia and vice versâ, led to the conclusion that meconate and hydrochlorate of morphia are in no way antagonistic to Calabar bean.

Antagonism between Sulphate of Atropia and Meconate of Morphia. Dr. J. H. Bennett, F.R.S.E. (From the Report of the Committee of the British Medical Association; *Brit. Med. Journ.*, No. 721, 518; No. 722, 547; No. 723, 581.) The inferences drawn from experiments on rabbits are the following:—

1. Sulphate of atropia is physiologically antagonistic to meconate of morphia within a limited area.

2. Meconate of morphia does not act beneficially after a large dose of sulphate of atropia, for in these cases the tendency to death is greater than if a large dose of either substance had been given alone.

3. Meconate of morphia is not specifically antagonistic to the action of sulphate of atropia on the vaso-inhibitory nerves of the heart; and,—

4. The beneficial action of sulphate of atropia after the administration of large doses of meconate of morphia is probably due to the action sulphate of atropia exercises on the bloodvessels. It

causes contraction of these, and thus reduces the risk of death from cerebral or spinal congestion, as is known to occur after the introduction of fatal doses of meconate of morphia. It may also assist up to a certain point, not precisely fixed in these experiments, by stimulating the action of the heart through the sympathetic, and obviating the tendency to death from deficient respiration observed after large doses of morphia.

From experiments made on dogs, it appears that in these animals sulphate of atropia modifies the symptoms of poisoning by meconate of morphia, diminishes their intensity, and may even save life after a fatal dose of the latter. It is therefore decidedly antagonistic, but within a limited area. In man, sulphate of atropia would be too dangerous and uncertain a remedy to depend on in cases of poisoning by opium or any of its salts, but where the heart's action is greatly diminished it is directly indicated.

Antagonism between Tea, Coffee, Theine, Caffeine, Guaranine, on the one hand, and Meconate of Morphia on the other. Dr. J. H. Bennett, F.R.S.E. (From the Report of the Committee of the British Medical Association; *Brit. Med. Journ.*, No. 724, 615; No. 727, 697, and No. 729, 771.) In this investigation one hundred and seventeen experiments were performed, and the following conclusions arrived at:—

1. Theine is antagonistic to meconate of morphia, inasmuch as the action of the one substance modifies that of the other, and may even save life from a fatal dose of either substance.

2. Meconate of morphia delayed the appearance of the convulsions characteristic of the action of theine; but, on the other hand, theine, if given in large doses, did not affect in a marked degree the action of meconate of morphia, because symptoms of poisoning by theine were soon manifested.

3. Further experiments on cats showed that (a) while a cat may recover from the effects of a dose of $1\frac{3}{4}$ grain of meconate of morphia given alone, it will not recover from the effects of a dose of 2 grains, even although the effects of the latter dose are modified by those following the introduction of 4 or 5 grains of theine; (b) that in three cases the animals recovered from the effects of $1\frac{7}{8}$ grain of meconate of morphia and 4 to 5 grains of theine, while they died when the same dose of meconate of morphia was administered eight days afterwards; (c) that when the dose of theine was increased beyond 5 grains, the animals invariably died, apparently from the effects of theine.

4. Experiments on rabbits, as to the antagonism between me-

conate of morphia and theine, were found to be unsatisfactory as regards the purposes of this inquiry, because both drugs produce epileptiform convulsions in these animals.

5. The results obtained in investigating the action of caffeine and guaranine as antagonists to meconate of morphia were similar to those observed with reference to theine.

6. Experiments were made on dogs, to ascertain the effects of strong infusions of tea and decoctions of coffee as antagonists to meconate of morphia. These were unsatisfactory, chiefly because the tea or coffee was usually vomited so soon as to prevent the possibility of the exercise of any physiological antagonism. At the same time, it was observed in several instances that the administration of tea or coffee so excited the animals as to prevent them from falling into stupor or coma after a dose of meconate of morphia, which would have produced this effect had the tea or coffee not been given.

Antagonism between Strychnia and Monobromated Camphor. Dr. Valenti y Vivo. (From the *Medical Record*.) The author has made a series of researches on the supposed antagonism between these two substances; and has arrived at the conclusion that monobromated camphor may be considered as an antidote for strychnia. According to Dr. Valenti, the following conclusions are well established (*Siglo Medico*, April 18, 1875).

1. Twelve dogs, after taking a fatal dose of strychnia, were saved by the use of monobromated camphor. The experiments were practised in a satisfactory manner, with crucial tests.

2. The tetanic convulsions produced by strychnia may be reduced in force and frequency by the use of monobromated camphor. The action of the antidote is rapid and sure.

3. The hyposthenic action of the monobromated camphor mitigates the reflex activity of the poison. The tonic convulsions are converted into clonic.

4. The physiological antagonism is comparatively limited. A strong dose of monobromated camphor is necessary to antagonize the effects of strychnia.

5. The monobromated camphor acts on the sympathetic nerve; this is demonstrated by the myosis and the cardiac paralysis which were observed after its administration.

6. After an overdose of monobromated camphor, the united effects of the poison and the antidote produce death by syncope; when death takes place during the strychnism and without the antidote, cardiac impulses are observed *post mortem*; when it takes place after

and through the use of bromide, cardiac impulses are never observed.

7. The experiments show that it is preferable to introduce the monobromated camphor by gastric ingestion, and in small and repeated doses. The subcutaneous method, employed in some experiments, has not given satisfactory results.

Dr. Valenti points out the importance of this antagonism in practical medicine. He thinks monobromated camphor may be used with advantage in cases of poisoning by strychnia, in quantity varying from four to six grams given in small doses.

Notes on a New Preparation of Meat. S. Darby. (*Pharm. Journ.*, 3rd series, v., 181.) A preparation of meat claiming to possess very considerable renovating powers has lately been introduced to the notice of the medical profession in Germany. As the nature of it appears to have been altogether misunderstood in this country, whilst the name given to it would foster this error, the author's note as to its constituents may probably be of interest.

The preparation referred to is named the "Leube Rosenthal'sche Fleische solution," and the method given by Dr. Mirus, in the *Chemisches Centralblatt* of July 16, 1873, for its production is as follows:—

"Two hundred and fifty grams of finely minced meat are put into a half-quart mineral water bottle; this is then filled to three fourths of its contents with water to which has been added one per cent. of hydrochloric acid, and the lumps of meat broken by well shaking. The bottle and its contents are placed in a steam boiler, and heated under pressure for fifteen hours continuously. The bottle is now removed, and the mixture rubbed up, so as to obtain it in a uniform state, after which it is again heated as before for fifteen hours. The acid mixture is to be exactly neutralized with carbonate of soda, and evaporated to the consistence of gruel."

This preparation, as obtained from Dr. Mirus, was a light pinkish coloured emulsion, and the contents of one tin, weighing 52½ drams, yielded on evaporation to dryness a residue which weighed 12½ drams. Two hundred and forty grains of this dry solid were thoroughly exhausted by repeated washings with tepid water, the residue dried, and the watery solution evaporated to dryness. The dried soluble extractive weighed 79·5 grains, whilst the insoluble portion weighed 157·5 grains.

The author then boiled finely chopped lean fresh meat (a portion of which when dried gave 26 per cent. of residue), with five times its weight of water, in a Papin's digester, for thirty hours; filtered,

well washed, and dried the residue, and evaporated the solution with the washings also to dryness. From 1000 grains of meat were obtained 82.2 grains dry soluble extract, and 182.0 grains insoluble residue.

BY COMPARISON.

Meat digested with water only in a Papin's digester, gave for 1000 parts:—		The Leube Rosenthal'sche preparation gave for 1000 parts.	
Soluble extract	88.2	Soluble extract	76.0
Insoluble residue	182.0	Insoluble residue	153.0
Water	729.8	Water	771.0
<hr/>		<hr/>	
1000.0		1000.0	

or, comparing the relative proportion of soluble to insoluble in the dried matter,—

Meat simply digested in a Papin's digester gave for 100 parts.		The Leube Rosenthal'sche preparation gave for 100 parts.	
Soluble	32.7	Soluble	33.2
Insoluble	67.3	Insoluble	66.8
<hr/>		<hr/>	
100.0		100.0	

a difference so slight as to warrant a belief that the solution of other matters than those soluble in cold water was altogether due to the stewing under pressure, and in no way affected by the dilute acid used in preparing the Leube Rosenthal product; and that this preparation, as might have been anticipated, is meat, the fibrine of which is merely in a very finely divided condition, and not changed into peptone. The term applied to it of "flesh solution," although convenient, is evidently therefore altogether a misnomer.

Von Wittich states that dilute acids alone will convert fibrine into peptone, but according to his experiments, it required a digestion of twenty-four hours' duration, at a temperature from 86° to 104° F., to change only one per cent. of the fibrine into peptone, and although it remains to be shown that by a prolonged action the whole of the remaining fibrine (99 per cent.) would be converted, and without undergoing further change, yet any one conversant with the treatment of meat needs not be told that even were it so, and at the rate previously indicated, such a method would be totally inapplicable for any considerable quantity.

It is not, perhaps, assuming too much to state that at present no other method is known by which the fibrine of flesh can be changed to a soluble condition, and the whole meat rendered soluble and acceptable as an article of diet, than that by means of pepsin and dilute acid, as in the case of the preparation known as "fluid meat."

The authors of the Rosenthal'sche Fleisch solution, so far as Mr. Darby is aware, do not claim that they convert the fibrine into peptone, and any mention of "fluid meat" would be uncalled for here, were it not that the two preparations have been mistaken as identical, and that it has been assumed that they both consist of peptones.

It has been clearly shown that the German preparation does not consist of peptone, and that it is principally insoluble material, in no respects possessing the properties of "fluid meat." The latter substance contains the albuminous together with the extractive principles of meat, and is therefore preferable to the extractum carnis. Cases are now recorded of impaired and even suspended powers of digestion, both from natural and accidental causes, in which "fluid meat" has not only sustained life during long periods, but enabled a restoration of the digestive functions to become effected.

Chemical Examination of a Substance called Cincho-Quinine. E. Scheffer and C. L. Diehl. (*Pharmacist*, May, 1875, 129.) For some years a preparation called *cincho-quinine*, has appeared in the American market, and has been extensively advertised as an accurate alkaloidal representative of cinchona bark. As this article has gained favour with many physicians on account of its tonic properties and its cheapness, as compared to sulphate of quinine, the authors have subjected it to a careful chemical examination, in order to place it before the public on its true merits.

The results of their experiments may be summed up in the following:—

1. Cincho-quinine is composed mainly of cinchonine, a considerable portion of which is in combination with sulphuric acid, and is, therefore, sulphate of cinchonine.

2. It contains less than 1 (one) per cent. of the alkaloid quinine, which exists either as alkaloid or as sulphate.

3. It contains less than 5 (five) per cent. of the alkaloid quinidine, which exists either as alkaloid or as sulphate.

4. If it contains any cinchonidine at all, this can be present only in very small quantities; since the residue, remaining after exhausting precipitated cincho-quinine with ether, did not contain it, and it could, therefore, have been contained only in the ethereal liquid, in which it was not searched for.

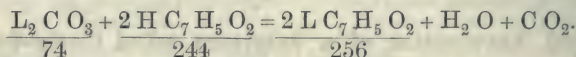
5. It contains traces of sulphate of ammonium, and is, therefore, precipitated from combination with sulphuric acid by ammonia.

6. It is not an alkaloidal representative of cinchona bark.

Benzoate of Lithium. E. B. Shuttleworth. (*Canadian Phar-*

maceutical Journal.) This salt has been proposed as a remedy for certain disorders of the urinary organs, and appears to possess advantages over the forms in which lithium has heretofore been exhibited. The comparative insolubility of the carbonate has always proved a bar to its general employment, and though the citrate is in this respect much more eligible (only twenty-five parts of water being required for solution), yet the salt is of an unstable and deliquescent character, and somewhat troublesome to prepare and dispense. The benzoate is not open to any of these objections, and has the additional advantage of containing, in combination, an acid which is itself of no inconsiderable repute in the treatment of patients suffering from various forms of urinary deposits.

Benzoate of lithium may be most advantageously prepared from the carbonate—



In a wedgwood dish put one ounce avoirdupois of carbonate mixed with nine ounces of water. Heat gently, and add benzoic acid gradually until effervescence is no longer produced. About three and a quarter ounces will be required. Evaporate to dryness, stirring constantly, and reducing the heat towards the close of the operation. The yield will be nearly three and a half ounces.

By following this process, a much smaller quantity of water, and consequently less evaporation, will be needed than if the benzoic acid be dissolved and the carbonate added thereto. If impurities or any discoloration of the benzoic acid, render it necessary to filter the solution, three ounces more water may be added before evaporation; and, if required, a little purified animal charcoal may be used. The benzoate can be obtained in crystals by withdrawing the heat, and setting the solution aside immediately after the benzoic acid is all added.

Watts says the lithium salt of benzoic acid is uncrystallizable. This is incorrect; the benzoate may be crystallized without the slightest difficulty. It takes the form of glistening pearly scales, or laminæ, somewhat resembling iodide of cadmium, but less lustrous. The crystals feel soapy or greasy to the touch; have a cool, sweetish, and not disagreeable taste, and are perfectly permanent in the air. The solution has an acid reaction.

The salt is found to be soluble in three and a half parts of water at 60° F.; in two and a half parts at 212° F.; and in ten parts of cold alcohol of .838 sp. gr.

Preparation of Cantharidine Tissue. E. Rosenberg. (*Chem. and Drug.*, 1875, 44; from *Pharm. Zeit. für Russland.*) A solution is prepared of 5.5 grams turpentine, 2 grams sandarac, and 8 to 10 drops olive oil, in 180 grams of cantharidine ether. The solution is then applied to silk taffeta, extended on a frame (the taffeta must have been previously treated twice with isinglass solution and dried), four times in succession, quickly and uniformly: a flat brush is the best to use. The cloth must be allowed to dry completely after each application before the next is made. After the last coat the taffeta is once more treated with a *spirituous* solution of isinglass. The isinglass solution is obtained by steeping 15 grams of the best finely cut isinglass in 150 grams spirit of wine, of 32 per cent., subsequently boiling two or three times, straining, and lastly adding 40 drops of glycerin. To prepare cantharidine ether, 90 grams of coarsely powdered cantharides are put into a retort with 600 grams spirits of wine of 92 per cent., 205 drops of diluted sulphuric acid are added, and the whole boiled. After cooling, express and again boil the residue in the retort with 570 grams of spirit and 195 drops of diluted acid, and again express. The spirit is recovered from the mixed liquids by distillation, and the residue mixed with water. After standing one hour the fat which separates is removed and washed, and the wash water agitated with the remaining fluid and 180 grams ether. After the ether has separated from the acid liquid, it is removed and preserved in well closed bottles. In application, the taffeta is simply moistened with a little water, and made to stick by gentle pressure and smoothing with the finger. By moistening with somewhat warm water, the taffeta may be removed at pleasure without smarting: in other respects it more than satisfies the claims usually made on an article of this nature. The active principle being closed between two gelatinous layers, its efficacy is not impaired even after very long keeping. The action is exceedingly rapid, and causes no smarting.

The Action of Sunlight on Olive Oil. L. Moschin. (*Landwirthschaftl. Versuchstation*, xv., 1; *Chem. and Drug.*, 1875, 115.) The author says that an exposure of one month to sunlight suffices to produce a complete change in the colour of olive oil, without any alteration of the specific gravity. If sulphuric acid be added to oil so treated, the latter assumes, not a greenish colour, but a reddish yellow; with nitric acid or caustic soda, a whitish colour is produced. If the oil be set in an open vessel, it still retains after a month the property of thickening under the influence of fumes of nitric acid; after three months the oil, though changed in colour,

loses this property, and does not thicken even when acted upon by a solution of mercuric nitrate which is saturated with nitric acid. The oil altered by sunlight has a strongly acid reaction, a somewhat rancid smell and taste, and easily dissolves aniline red, becoming intensely coloured. From the foregoing it will be seen that olive oil can only be distinguished from others by means of nitric or sulphuric acid or caustic soda when in the normal state; and that the use of aniline red, recommended by Jacobson for the detection of free fatty acids in falsified oil, may lead to the condemnation of an oil which has become somewhat rancid from the action of sunlight. Olive oil in the normal condition holds in solution a yellowish substance which is coloured green by acids, and which is decomposed by sunlight, so that it reacts neither with acids nor with caustic soda. Besides this, uncombined acids are formed under the influence equally of sunlight and of acid bodies, and the oleine assumes the nature of elaidin.

The Relations of the Atropines. K. Calmberg. (*Archiv der Pharm.*, Nov., 1874, 422; *Chem. and Drug.*, 1875, 115.) The author says that the identifying reactions of atropine, prepared according to the Pharmacopœia (Germ.), do not correspond in respect of its behaviour towards sulphuric and nitric acids. With the first named acid it immediately takes a faint yet permanent brown colour (due to carbonization), and with nitric acid, in which it dissolves much more easily than in sulphuric, it does not assume the faintest yellowish tinge: when this acid is added to it in a watch glass, or a small test tube, a colourless solution is obtained, which from the first moment is not more pronounced in tinge than the nitric acid used. On the other hand, according to Dobereiner and Daffos, the identity of this dangerous poison may be established beyond a doubt by means of gold chloride and tincture of iodine. The first of these causes in a watery solution of the sulphate of atropine a sulphur-yellow precipitate, and the second one of a kermes-brown colour.

Detection of Oil of Turpentine and Oil of Rosemary in Machine Oils, especially in Olive Oil. M. Burstyn. (*Dingler's Polytechn. Journ.*, 214, 300.) Olive oil which is intended to be used as machine oil, is frequently mixed with oil of turpentine or oil of rosemary with the intention of rendering it unfit for culinary purposes. The author recommends the following improved process for the detection of such an admixture:—

If a sample of the olive oil be agitated with an equal volume of alcohol of 90 per cent., nothing but the free acids and a small trace of the oil are dissolved by the latter (see *Year-Book of Pharmacy*,

1873, 354). If, however, the oil contains oil of turpentine or oil of rosemary, the greater part of these will pass into the alcoholic solution. After a few hours' rest the alcoholic stratum is separated from the oil, and distilled on a water bath; the acids will remain in the residue while the volatile oil passes over with the alcohol, and may be detected in the distillate by the turbidity produced on the addition of water, provided it amounts to not less than 0.1 per cent. per volume. For the detection of smaller quantities, a few drops of strong sulphuric acid should be carefully added to the distillate, when a distinct pink coloration will be produced at the point of contact of the two liquids, which is best seen by holding the test tube against a piece of white paper. This reaction is very delicate, and gives a decided result, even if the distillate contains no more than $\frac{1}{10000}$ of oil of turpentine or rosemary. In the presence of larger quantities the sulphuric acid assumes a pink colour as it sinks to the bottom. Which of the two volatile oils is present can be decided by the odour of the distillate, especially on being mixed with water.

Crystallized Acetate of Ammonia. M. Berthelot. (*Journ. d' Pharm. et de Chim.*, 4th series, xxi., 183; *Pharm. Journ.*, 3rd series, v., 745.) The author describes the preparation of this salt, which he believes had not previously been obtained pure in an isolated state; the crystalline substance that is sold in commerce under this name being ordinarily an acid salt analogous to the binacetate of potash formerly met with, and containing acetimide when it has been prepared with heat.

The author states that the true acetate of ammonia may be obtained in the solid form by evaporating the solution in the presence of an excess of ammonia, and finishing the operation at a low temperature. In operating he dissolves glacial acetic acid in caustic ammonia in a cooled retort, taking care to add sufficient water to prevent crystallization during the saturation, which would give an imperfect product. The mixture is then evaporated in a water bath in a current of ammoniacal gas until the liquid solidifies upon cooling. It is then introduced into a large capsule, which is placed under a large bell glass with caustic lime, and a considerable quantity of gaseous ammonia is injected under the glass. After an interval of several days, the bell-glass is removed, the crystalline mass is coarsely broken up so as to facilitate the penetration of the ammonia vapour, and the capsule is replaced over the lime with more gaseous ammonia. The operation is slow, and requires several months to complete it, but the author states that he has thus pre-

pared by it some hundreds of grams of perfectly pure acetate of ammonia. It is an extremely soluble salt, crystallizing in large needles analogous to nitrate of potash, and resembling formiate of ammonia. The salt has no acid reaction. Its analysis yielded 21.9 N H₃, the formula C₂ H₄ O₂ N H₃ requiring 22.0. Its solution in water disengaged a small quantity of heat. It is somewhat analogous to the acetates of potash and of soda, which are also obtained anhydrous by drying them at the ordinary temperature, and which disengage heat in dissolving.

Freezing Mixtures. M. Berthelot. (*Comptes Rendus*, lxxviii., 1173; *Pharm. Journ.*, 3rd series, v., 202.) The researches of the author upon the crystallized hydrates of sulphuric acid have supplied him with the data necessary for calculating the lowering of temperature which these hydrates develop when mixed with snow or powdered ice. Some of these details he has discussed in their relation to freezing mixtures in general in a paper from which the following is taken. It may be as well to notice that he uses the old notation (C = 6, O = 8) throughout.

The thermic effect which is produced when snow is mixed with solid crystallized bihydrated sulphuric acid is the sum of three effects, viz.,—the fusion of the acid, which absorbs heat; the fusion of the snow, which also absorbs heat; and the combination of the two liquids, which disengages heat. Thus, for example, with three parts of acid and eight parts of water—that is to say, in equivalents, S O₄ H, H O (58 grams) and 17 H O (153 grams)—both bodies solid and taken at 0°—

	Heat units.
The melting of S O ₄ H, H O absorbs, according to the author's experiment	— 1,840
The melting of 17 H O, according to M. Desains, absorbs	— 12,155
Upon the union of S O ₄ H, H O with 17 H O the two liquid bodies disengage	+ 4,900
	— 9,015

This is the quantity of heat absorbed by 211 grams of the mixture. To ascertain the lowering of the temperature, it is sufficient to divide it by the product of the weight of the mixture and its specific heat. Thus—

$$-9,015 \div (211 \times 0.813) = -52.6^{\circ}.$$

If the operation is conducted at a lower initial temperature and with ingredients previously cooled, a calculation based upon the

formula which expresses the variation of the heat of reactions with the temperature, shows that the heat absorbed increases by the variation of the heat of combination = $-(0.1715 - 0.089 \text{ heat units})$, or about $\frac{1}{11.6}$ for each degree less in the initial temperature. Commencing at -20° , the additional lowering would be 62° , and so on, increasing but slowly, in proportion as the initial temperature is lower.

If the bihydrated sulphuric acid, in the liquid state, be employed at 0° , the heat absorbed would be only -71.55 heat units, and the lowering -42° . Commencing at -20° , it would be -50° , which would lead to a final temperature of -70° .

Lastly the monhydrated sulphuric acid liquid, $\text{SO}_4 \text{H}$, in the presence of $18 \text{ H}_2\text{O}$, solid, starting at zero, will absorb only 4.025 heat units, producing -23.7° .

It will thus appear that the absorption of heat and lowering of temperature vary a little with the initial temperature, the final temperature being increasingly lower in proportion as the operation is commenced with a mixture previously more cooled. The only limit is the freezing point of the mixture of water and sulphuric acid, but that point is excessively low.

It has been found by previous authors that a cold of 32.5° can be obtained with three parts of snow and one part of liquid sulphuric acid, containing one fifth of its weight of additional water. An analogous mixture, with its ingredients previously cooled to -7° would lower the temperature to -51° . From the eighteenth century, mercury has been congealed with similar mixtures of snow and sulphuric acid. MM. Pierre and Puchot, in recent experiments, have obtained only -26° with a mixture of three parts of crystallized bihydrate and eight parts of pounded ice.

All these numbers are below those deduced by theory, but it is necessary to observe that the heat is diffused between the mixed substances and their surroundings; radiation leads to considerable loss. Besides, and this is the principal cause of the differences observed, one portion of the ice remains solid, and diminishes proportionally the cold obtained. Snow is preferable to ice in this respect.

During last century, it was principally by means of mixtures of dilute nitric acid and ice that operations for the solidification of mercury were conducted, a problem that greatly interested the chemists of former days. The following is the calculation relative to one of the most frequently employed of these mixtures. With a mixture of nitric acid ($\text{NO}_3 \text{H} + 3 \text{H}_2\text{O}$) and twice its weight of

snow ($10 \text{ H}_2 \text{O}_2$), the heat absorbed, starting at 0° , is 11.000 heat units, the lowering of temperature -56° .

Generally, the artificial production of cold depends upon the following artifices, either alone or combined in the same operation:—

1. Transformation of a liquid or a solid into gas (vaporization of ether or sulphurous acid, treatment of a bicarbonate with an acid).

2. Liquefaction of a solid in contact with a liquid (solution of salts) or with another solid (crystallized sulphuric acid and ice, ice and chloride of calcium, etc.).

3. Chemical reaction effected in the midst of a liquid with the formation of substances the solution of which would absorb more heat than that of the primitive compounds (solution of an alkaline acetate, and solution of tartaric acid, according to the author's experiments); or the formation of bodies that gradually decompose in the liquid, such as the salts of feeble acids (carbonate of ammonia, formed by a mixture of solution of an alkaline carbonate and a solution of sulphate or nitrate of ammonia), the acids, salts, etc.

4. Whatever be the reaction employed, the lowering of the temperature ($t - t_1$) may be calculated from a knowledge of the heat absorbed in the reaction (Qt), the weight of the substances, between which it is distributed (p, p'), and their respective specific heats (c, c').

$$t - t_1 = \frac{Qt}{\sum pc}.$$

This reduction changes slowly with the initial temperature (t) as long as Qt is considerable and the specific heats can be regarded as constant. But it is limited by the freezing points of the saline solutions, which do not admit of the indefinite reduction of the temperature.

It should be observed that no other system is capable of producing a refrigeration comparable to that produced by the integral transformation of a liquid into gas, as may be ascertained by calculation. For example, ether in vaporizing produces a lowering of temperature theoretically of -192°C. ; sulphide of carbon of -530°C. ; liquefied ammonia of -460°C. ; and the protoxide of nitrogen of -440°C. But the refrigeration is arrested at points far short of these; which arises from the tension of the vapour of the liquid that is changed into gas becoming so feeble that the cold produced in a given time is compensated by the ambient radiation, by which

it becomes reheated. In fact, the cold produced by the vaporization of a liquid, even in a vacuum, scarcely allows of the lowering of the temperature more than 60° to 80° C. below the boiling point of such liquid under atmospheric pressure; hitherto only in a single case, the congelation of water, has 100° been exceeded. However this may be, these figures, both theoretical and practical, show that no process of refrigeration is comparable to vaporization; and the same result has been arrived at industrially. But M. Berthelot is of opinion that a better directed employment of the sources of cold, which theory indicates to be at our disposal in liquefied gases, should make it possible to go much lower than has been done at present, and to approach nearer to that actual zero which appears to be about -273° C.

Latent Pepsin. G. W. C. Phillips. (*Pharmacist*, viii., 200.) The researches of Scheffer, Symes, and others, have led pharmacists and medical men to assume that pepsin cannot exist in the presence of alcohol, and that the wines and elixirs of pepsin, therefore, do not contain the principle in an active condition. This theory is strongly opposed by the author, who states that pepsin does exist in a marked degree in all well prepared wines and elixirs, and only needs proper treatment to bring out its full chemical and medicinal effects. His statement is supported by the following experiments:—

One ounce of Boudault's wine of pepsin was digested with 120 grains of coagulated albumen at a temperature of 98° F. for three hours. At the end of that time the albumen was examined and weighed. The only apparent effect this treatment had upon it was to colour it brown, and harden it; a slight decrease in weight was probably owing to loss of water.

This experiment was repeated without alteration in the quantities; the only difference being in the addition of an equal volume of water to the wine of pepsin. At the expiration of three hours the albumen was again examined. It had decreased in weight thirty grains, and presented the characteristic appearance of albumen which has been acted upon by pepsin; the sharp angles were gone, and in their place a granular surface was presented.

Another experiment with the same quantities, the water being increased to three ounces, showed a decrease in the albumen of fifty grains. A sample of the wine of pepsin used in these experiments was then examined to determine the amount of alcohol it contained. Horsley's process, given in the *Chemical News* of October 19, 1861, was employed, and it was found to contain eight per cent. of free alcohol.

The conclusion drawn by Mr. Phillips from these and other experiments is this:—That while a carefully made wine of pepsin, not containing over ten per cent. of alcohol, may and does contain pepsin, that it exists in a latent state, and that when diluted with the juices of the stomach, at the normal temperature of that organ, it regains its activity, and will perform its digestive functions.

Atropia as an Antidote to Poisonous Mushrooms. Dr. T. Lauder Brunton, F.R.S. (*Brit. Med. Journ.*, No. 724, p. 617.) One of the most perfect instances of antagonism is the power of atropia to counteract the poisonous principle of mushrooms. This principle seems to be the same, or nearly the same, in different species of mushroom, for they all seem to have similar actions. The *Agaricus muscarius*, *A. phalloides*, *A. pantherinus*, *Boletus Satanas*, and *Russula foetens*, all resemble one another in action; but the effects produced by the same sort of fungus may vary in different individuals. They all act more or less on the intestinal canal and heart, and apparently also on the brain. The usual symptoms are uneasiness in the stomach, vomiting, purging, a feeling of constriction in the neck, want of breath, giddiness, fainting, prostration, and stupor. Sometimes the intestinal symptoms are most prominent; at other times the cerebral ones. The most extraordinary action of poisonous mushrooms is upon the heart. The active principle of the *Agaricus muscarius*, or *Amanita muscaria*, was separated by Professor Schmiedeberg of Strasburg, and named by him muscarin. The merest trace of this alkaloid will arrest the pulsations of the frog's heart almost instantaneously, and prevent it from ever beating again unless its effect be counteracted. But if a minute quantity of atropia be brought into contact with the organ it will begin to pulsate again, and will go on beating for a long time. The author has stopped the motions of a frog's heart by dropping a little dilute muscarin upon it, and has again made it pulsate after it had remained perfectly motionless for no less than four hours. Muscarin does not stop the heart of mammals so readily as that of the frog, but it renders the pulse slower, and intermissions are sometimes noticed in cases of poisoning by mushrooms. A little atropia at once counteracts the effect of muscarin on the heart in mammals just as it does in the frog.

But, besides this remarkable effect of muscarin on the heart, discovered by Professor Schmiedeberg, it possesses one no less extraordinary upon the pulmonary vessels. Intense dyspnoea was one of the most marked symptoms produced by the poison. This symptom and the comparative emptiness of the arteries by which it is accom-

panied, are proved by the author's experiments to be due to spasmodic contraction of the pulmonary vessels. The dyspnoea, as well as the other symptoms of muscarin poisoning, disappears in animals almost immediately after the injection of atropia, and, indeed, Schmiedeberg and Koppe describe an experiment in which the use of this antidote during the death struggle completely restored a dog which had been poisoned by muscarin. They therefore recommend that in cases of poisoning by mushrooms, the stomach should be emptied, and then atropia injected subcutaneously. It is a curious circumstance that, in poisoning by mushrooms, tickling the fauces seems to prove much more efficacious in producing vomiting than the administration of tartar emetic. The antidote may be given by the mouth, either in the form of tincture of belladonna or liquor atropia; but Schmiedeberg and Koppe prefer subcutaneous injection, on account of the more rapid absorption and speedy action of the drug, as well as the more accurate adjustment of the dose. The dose for subcutaneous injection should be about one hundredth of a grain, or about one minim of the liquor atropiæ sulphatis (B.P.), repeated if necessary until the dyspnoea is relieved.

Mercurial Ointment of Commerce. J. A. Muthersbough. (Abstract of an inaugural essay; *Amer. Journ. Pharm.*, 4th series, iv., 409.) In consideration of the varying strength of the mercurial ointment as found in the market, the author thought that it might be of some interest to ascertain its variation in strength, which, as will be seen by the following results, is considerable. Ten samples of the ointment were obtained from different establishments, and in each and every case they were represented to be the officinal article. 100 grains of these ointments yielded respectively: 1, $48\frac{1}{2}$ grs.; 2, $48\frac{1}{2}$ grs.; 3, 48 grs.; 4, 46 grs.; 5, 30 grs.; 6, 30 grs.; 7, 26 grs.; 8, 25 grs.; 9, 24 grs.; and 10, 22 grains of mercury. The experiments were all conducted alike and under similar circumstances. The process employed to separate the mercury was as follows: 100 grains ointment were put into a large test tube, with one fluid ounce of muriatic acid, and boiled until the grease separated and floated on the surface, the liquid portion was then separated from the black powder; to this powder another fluid ounce of muriatic acid was added, and the whole boiled until the mercury ran into a globule; the liquid portion was separated as before, the mercury washed with benzin to remove the last traces of fat, and finally washed with water, dried and weighed. The ointments that yielded from 45 to 48 per cent. of mercury, may be considered as being of full strength, as in separating it by

the above process there is a slight loss, say of about $2\frac{1}{2}$ per cent. to 5 per cent. A sample of mercurial ointment known to contain one third of mercury was examined by this process, and yielded the requisite amount of mercury. Three samples of blue mass were also tested in a similar manner, and in each case they were found to be of the official strength.

Linimentum Belladonnæ. C. Umney. (*Pharm. Journ.*, 3rd series, v., 281.) The marked difference in the appearance of belladonna liniment made according to the B.P. process, and the same preparation obtained from a proportionate quantity of alcoholic extract (prepared by the complete exhaustion of the root) induced the author to perform a series of experiments, with a view of ascertaining the extent of the exhaustion of belladonna root by maceration and slow percolation. Knowing from experience the unsuitability of the coarsely powdered root for the preparation of a liniment of the B.P. strength, he worked with a moderately fine powder, passing through a sieve of 40 to 50 meshes to the linear inch.

100 grams of this root, thoroughly moistened with spirit, tightly packed in a displacement apparatus, and allowed to digest for three days, were slowly percolated until 100 c.c. had passed through. The residue was treated with spirit, and similarly percolated until four other portions, each of 100 c.c., were obtained.

The extractive each contained was determined by evaporation and drying at 100°C ., until the weight was constant. The results were:—

1st percolate	7.58	grams of extract.
2nd	4.31	„
3rd	3.08	„
4th	2.25	„
5th	1.54	„

The first percolate was charged with green colouring matter, which was less perceptible in the second, and almost absent in the other three.

The total extract obtained from the root was upwards of 18 per cent. (18.75) of which—

1st percolate contained	40.4	per cent.
2nd	22.9	„
3rd	16.4	„
4th	12.0	„
5th	8.3	„

It would therefore appear that even under very favourable

circumstances the root in the liniment of belladonna is not even half exhausted (40 per cent.), at the stage at which the B. P. directs the percolation to be stopped, and the chances are that in the majority of cases, operating on coarsely powdered root, little more than one third (33·3 per cent.) is extracted in the first percolate.

It would seem to be possible under favourable circumstances, by operating upon very fine powder, to prepare a liniment from half the quantity of root, almost as strong in extractive (and probably in its percentage of alkaloid) as the present officinal preparation.

The different appearance of a solution of extract in spirit, and the liniment prepared according to the official directions, is then chiefly due to the imperfect and uncertain exhaustion of the root, and also in a measure to the concentration of the green colouring previously referred to in the first percolate.

The author suggests for consideration on some future occasion, when a revision of the Pharmacopœia may be deemed necessary, either to substitute ten ounces of the root in fine powder for the present twenty ounces, and produce finally by the slowest percolation twenty fluid ounces of liniment, or to direct a solution of one part of alcoholic extract in ten parts of spirit of wine. Either of these plans would give more uniform results, and lessen considerably the loss of spirit of wine in the preparation of the liniment.

Tinctura Quinæ Ammoniata, B.P. J. F. Brown. (*Pharm. Journ.*, 3rd series, v., 281.) The writer states that there is no necessity for employing heat in the preparation of this tincture, as directed in the appendix. If the quinine be diffused through half the given quantity of proof spirit, then the solution of ammonia, previously diluted with the remainder of the spirit added, and the whole well shaken, a clear solution will be immediately obtained.

Approximative Estimation of the Strength of very small Quantities of Alcohol. Prof. C. T. Barfoed. (*Amer. Journ. Pharm.*, 1875, 7.) It being sometimes desirable to know (at least approximatively) the strength of very small quantities of alcohol, the author recommends to moisten small slips of filtering paper thoroughly with the alcohol, and set fire to them. If, after the alcohol has burned out, the paper slips catch fire readily, the alcohol must be stronger than 80 per cent.; if the paper barely catches fire, the strength may be presumed to be between 75 to 80 per cent.; if it does not catch fire at all, the alcohol cannot be stronger than 73-75 per cent. The small percentage of water existing in strong alcohol vaporizes by the heat of the burning alcohol, and conse-

quently leaves the paper dry. Alcohol of 73 per cent., or weaker, leaves the paper damp.

It will be seen that in this way the strength of even five drops of alcohol may be estimated.

Note on the Rectification of Alcoholic Liquids. J. U. Lloyd. (*Amer. Journ. Pharm.*, 4th series, v., 247.) After fluid extracts are made, there is a very considerable amount of alcohol left within the material operated upon, which, by persons having no dreg-still, can be recovered only by running water through the residue, and distilling the mixture; and sometimes the manufacturer is considerably annoyed by a tendency which the runnings from certain substances, such as sarsaparilla, exhibit for the formation of large amounts of froth, which, filling the still, interrupts the process by coming over with the alcohol.

This can be remedied by giving the runnings an acid reaction with sulphuric acid. Where a copper still is used, this will prove unobjectionable, as the menstruum will not corrode copper.

Preservative Effect of Chloroform on Vegetable Infusions, etc. J. B. Barnes, F.C.S. (*Pharm. Journ.*, 3rd series, v., 441.) In a paper read at the meeting of the Pharmaceutical Society, on December 2nd, 1874, the author stated that in consequence of a communication which he received from Dr. G. Pritchard, of Greenstreet, Kent, he made some experiments with the object of ascertaining the extent of the preservative effect of chloroform. He found that vegetable infusions of the B.P. strength will keep good for a reasonable time with the addition of five minims of chloroform to eight ounces of infusion, and that mucilage of acacia and mucilage of tragacanth will keep very well with the addition of one minim per ounce. The author attributes this effect of chloroform to its action on the fermentable substance held in solution, as he found that the same agent prevents alcoholic fermentation when added to a mixture of yeast and infusion of malt. Lactic fermentation also is checked by chloroform, for milk containing twenty drops of this substance in eight ounces remained perfectly good for over five days, though it was kept in a warm place and occasionally agitated. The author's statements received further support from a contribution on the same subject from Dr. F. J. Barrett, which was read the same evening.

Mr. Barnes does not suggest that chloroform should be added to the officinal infusions, but merely records the fact that it possesses preservative properties.

In the course of the discussion which followed the reading of the two papers, Mr. Martindale compared the action of chloroform to that of carbolic acid and other antiseptics, and suggested that it

would be interesting to know the effect of the addition of salicylic acid to vegetable infusions.

An Additional Method of Testing Glycerin. Prof. R. Godeffroy. (*Pharm. Journ.*, 3rd series, v., 441.) The methods published for the examination of the purity of glycerin are somewhat tedious, for the glycerin must be tested, not only with regard to its specific gravity, but also by means of all possible reagents for finding out of impurities which might be present. The author has now found a method by means of which some of the testing operations are much simplified.

If pure glycerin be placed in an open platinum or porcelain crucible, and heated up to 150° Celsius, it will begin to boil. It can now be ignited, and will continue to burn quietly with a blue and not very luminous flame, without diffusing the least smell or leaving behind it the least residue.

When the glycerin has a specific gravity below that of pure glycerin, it will boil under 150° Celsius, but at the moment of boiling it cannot be ignited.

If metallic salts be mixed with the glycerin they will remain as residue in the dish; the same would be the case when more highly organized combinations are present; these remain in the cup as a black, charred, or soot-like residue.

It may be mentioned that glycerin can be ignited very easily by means of a cotton wick, and continues to burn without smell; on extinguishing the flame there is no smell. The ordinary commercial glycerin of specific gravity 1.249 to 1.256 can easily be ignited by means of cotton; it is not necessary in this mode of ignition that the glycerin be anhydrous.

Lead Plaster. C. Umney. (*Pharm. Journ.*, 3rd series, v., 701.) The following table compiled by the author shows the proportions of litharge to one hundred parts by weight of olive oil, or of lard and oil, or lard only, as formerly used in Great Britain and Ireland, and as now used on the continents of Europe and America.

Pharmacopœia.	Olive Oil.	Lard.	Litharge.
London, 1746	100	...	56.0
" 1824	100	...	56.0
" 1851	100	...	53.8
Dublin, 1850	100	...	54.5
Edinburgh	100	...	49.9
United States	100	...	53.5
France	50	50	50.0
Germany.	50	50	50.0
Austria . . . . .	...	100	50.0
Greece	100	...	55.5
British, 1864 and 1867 .	100	...	43.6

It would seem from this table that the amount of litharge did, and now does, vary from 50 to 56 parts to 100 by weight of oil, or a mixture of lard and oil, as in France and Germany, or lard only, as in Austria, and as far as the author has been able to ascertain, no official formula in any Pharmacopœia has given a proportion of litharge so small as that of the British Pharmacopœias.

From inquiry made, not only in London but in other large cities, he finds that *emp. plumbi* is seldom made on a large scale by the official formula for druggists' use, but that from 50 parts to 60 parts of litharge to 100 parts by weight of oil is more generally adopted, and that in no case (as far as could be ascertained) do the manufacturers of the adhesive plaster of surgery and trade, which is spread in hundreds of thousands of yards annually, use the lead plaster of the British Pharmacopœia.

The composition of the British Pharmacopœia plaster may be described as a lead soap, with undecomposed olive oil, as may be seen from the greasy appearance presented by a piece of paper when the British Pharmacopœia plaster is spread, from its great proneness to rancidity upon keeping, and from the following experiment:—

10 grams of lead plaster of the London Pharmacopœia was thoroughly beaten with 5 grams of hydrated carbonate of potassium, and treated to exhaustion with alcohol (·825), the measure being finally made to one litre.

The B.P. plaster was treated by precisely the same method.

The resulting solutions of potash soap (Clarke's soap test) were then estimated by a solution of chloride of calcium (= ·0001 gram Ca C O_3 to each c.c.).

While 17 c.c. of the soap solution made from the P.L. plaster produced a perfect lather with 100 c.c. of the lime test, it took 18·5 c.c. from the B.P. plaster to produce a like result, showing that there was in the latter an insufficiency of litharge to convert the whole of the oil present into a lead soap; for had sufficient been present, the British Pharmacopœia plaster, containing as it does 69·6 per cent. of soap-forming material (oil) against 65 per cent. of the London Pharmacopœia, would have produced a soap test of as much greater strength as compared to that from the London Pharmacopœia plaster, as $69·6 : 65 = 6·6$ per cent. stronger.

Mr. Umney does not pretend that the proportions for lead plaster can be calculated, but if these figures mean anything, they prove that free oil is unmistakably present in the British Pharmacopœia lead plaster. He argues that considering the proneness of olive oil to rancidity after protracted boiling and exposure to air, it is not

desirable to have any excess of it present in adhesive plaster; and that a plaster with a larger proportion of litharge than the B.P. directs, though not so "sticky" at first, possesses more permanent adhesiveness than that of the B.P. He prefers a formula which is almost identical in the proportion of litharge throughout the world, to one opposed to the usages of trade, and which the manufacturers of adhesive plaster cannot use. From his own experience and that of others, he recommends the following simple formula for adoption in our national Pharmacopœia:—

Litharge	one part.
Olive Oil	two parts.

Phosphorus Pills. W. H. Walling. (*Amer. Journ. Pharm.*, 4th series, v., 253.) Having made a number of experiments with various excipients, the author recommends the following formula:—

R Butter of Cacao	gr. 300
Powdered white Castile Soap	gr. 200
Phosphorus	gr. 25

Melt the butter of cacao in a capsule, transfer to a quinine bottle, add phosphorus, and shake vigorously; add the soap, and continue agitation, applying some heat if necessary, until the phosphorus is all taken up. The mass is easily worked. Make into five hundred pills, containing one-twentieth grain of phosphorus each. Coat with mucilage of gum arabic and French chalk. They will stand a dry heat of 110° F. without running together. Their behaviour under heated water compared with other excipients is as follows:—

No. 1, pills made according to the foregoing formula; No. 2, by Bullock & Crenshaw; No. 3, by Warner & Co.; and No. 4 made with balsam of tolu.

All were placed in water at 90° F., and heat gradually raised. In two minutes the coating on No. 2 was entirely dissolved, but the pills were still hard.

In five minutes No. 1 completely liquefied.

The heat was now up to 98°, showing little effect upon No. 3, and none whatever upon No. 4.

In six minutes the coating on No. 3 was slowly dissolving. The heat was now raised to 110°. No. 3 coating dissolved. No. 4 softened, but retained their form. After half an hour's digestion, Nos. 2 and 3 were still undissolved, and no change had occurred in No. 4. These simple experiments show the relative solubility in the stomach of the various excipients used in making these pills.

Experiments with Pills of Phosphorus combined with various Excipients. Dr. C. G. Frowert. (*Amer. Journ. Pharm.*, 4th series, v., 254.)

SERIES I.

Experiments with phosphorus pills, combined with the excipient *balsam of tolu*, containing one twentieth of a grain of phosphorus in each pill. (No. 4 pill in preceding paper.)

Experiment 1.—Two pills were taken one hour after a hearty meal, by an adult male, in good health. Examination of fæces ten hours afterwards revealed the pills as entire as when swallowed, but somewhat softer.

Experiment 2.—Another person swallowed one pill half an hour after a hearty meal. The pill was recovered eighteen hours afterwards in the fæces,—hard, and as a nucleus, about which were gathered fæces one sixteenth of an inch in thickness.

SERIES II.

Experiments with phosphorus pills, combined with the excipient *silica*, containing one sixtieth of a grain of phosphorus in each pill. (No. 2 pill in preceding paper.)

Experiment 1.—Three pills were taken by the same party, and under the same circumstances as in Experiment 1 of tolu series. Examination of fæces eight, twenty, and thirty-two hours thereafter revealed no trace of the pills in that form.

Experiment 2.—Two pills were taken by the same patient as in experiment 2, series I., under the same condition.

No traces of pills in fæces in three succeeding evacuations.

SERIES III.

Experiments with pills of phosphorus, combined with the excipient *cacao butter*, containing one twentieth of a grain of phosphorus in each pill. (No. 1 pill in preceding paper.)

Experiment 1.—Same subject as in preceding experiments, and under same circumstances. Two pills were taken. In half an hour breath heavy, with odour of phosphorus.

After fourteen hours the fæces were examined; they showed no vestige of the pills.

Experiment 2.—Patient No. 2 swallowed two pills, one hour after a hearty meal. Odour detected in breath after a quarter of an hour. No traces of the pills were found in the fæces in succeeding discharges.

Liquid Extract of Ergot. A. W. Gerrard. (*Pharm. Journ.*, 3rd series, v., 805.) The author suggests several alterations in the process for the preparation of this liquid extract. In the first place he, in common with Mr. Umney and others, objects to treatment with ether as a wasteful and unnecessary proceeding, finding that the resultant extracts prepared with or without ether extraction do not differ either in their therapeutic effects or in their pharmaceutical value. In the second place he recommends the use of six pints of cold water instead of the three pints of water of 160° F., as during the contact with the latter the ergot swells, and the mass assumes a semi-colloid condition, so that pressing and straining, the next part of the process, is absolutely impracticable. The following process is recommended.

Macerate one pound of ergot in four pints of cold distilled water for twenty-four hours, then transfer to a muslin strainer, add two more pints of water, and when this too has passed through, press, evaporate the fluid to ten ounces, add eight ounces of rectified spirit; after the coagulation of the albumen, decant the clear portion, and strain the remainder through tow. The product should be made to measure sixteen fluid ounces.

In reference to the quantity of spirit to be added to the extract, the writer is inclined to think that one fourth of its volume would be preferable to one half of its volume as used at present. The larger amount causes the separation and crystallization of large quantities of phosphates, and might possibly interfere with the solubility of ecboiline, the active principle of ergot, which, according to Wenzell, is soluble in water.

The crystals which abound in the kept extract, and which according to Flückiger and Hanbury consist of acid phosphate of sodium and ammonium, are stated by the writer to be acid phosphate of potassium with a trace of ammonium.

A New Method of making Suppositories, Medicated Pessaries, and Bougies. Alexander Ellis. (*Pharm. Journ.*, 3rd series, v., 845.) Take a sheet of moderately stiff glazed paper (note paper will do, if of good quality), cut it into pieces of about three inches square. Pieces of less size will do if the operator can form cones with them, but for all ordinary purposes three-inch squares will be found the most convenient to work with. Taking hold of these squares between the forefinger and thumb of each hand turn them into cones precisely as a grocer would make a sugar paper, being particular to twist the bottom evenly and tightly. Now cut the top off evenly with a pair of scissors, so that the cone for fifteen grain

suppositories will measure one inch in length inside, the diameter at the top being three eighths of an inch, and for pessaries of one dram, one inch and three eighths deep, diameter, three fourths of an inch. Fill these cones with water, and insert them into the mouths of one-ounce phials; let the water remain in them for a couple of minutes, when they may be emptied; they are then fit to receive the ingredients of the suppository. During the time the moulds are being folded and prepared, the cacao butter can be gently melted. Allow it to cool until it becomes of a creamy consistence, or so as it will run. Stir in the active ingredient which has previously been rubbed up on a slab with a little oil, glycerin, or lard, such as its nature requires; then pour into the moulds, using a glass rod to direct the stream, and stirring between each filling. In two or three minutes the suppositories will be sufficiently hard to be transferred, with the paper mould still on them, to a mortar full or a stream of cold water. Let them remain there for about five minutes, or less in cold weather, when they can be taken up and the paper easily detached, commencing by unfolding the bottom of the cone. The suppositories will turn out perfectly formed, with perhaps the least fringe at the top, which may be pared off with a pocket-knife.

The writer has lately had to make rods one and a half inch long by one-third of an inch in diameter, as prescribed by Dr. Tanner in his "Practice of Medicine." These may be made by taking the same kind of paper as used for suppository moulds, but about eight inches square; roll it on the counter to the required diameter, something like a cartridge mould. Tie it with shop twine in the middle and at each end. Seal up one end with sealing-wax, and insert it into an eight ounce bottle, letting it pass to the bottom. Any number of these moulds may be made at a time. Now proceed as directed for suppositories, and when the rods are sufficiently hardened, cut the twine, place them on a slab, when the paper can be easily unrolled from them, and the rods cut into the required lengths.

Examinations of some Specimens of Opium. Prof. Flückiger. (*Pharm. Journ.*, 3rd series, v., 845.) The following samples have been examined in the author's laboratory mostly by Dr. Buri:—

I. *Patna* garden opium, 1838, wrapped in wax. Under the microscope it was seen to consist for a large part of nice crystals, and to be devoid of starch. The crystals may partly consist of alkaloids, partly of sugar.

II. *Medical Indian* opium, 1852–1853, portion of a square brick. It contained large crystals, no starch.

III. *Abkari* provision opium, Patna, No. 5380 (see also "Pharmacographia," p. 49). Small crystals, no starch.

IV. Garden *Behar* opium; exquisitely crystalline, no starch.

V. *Malwa* opium, portion of a flat cake. This was not distinctly crystallized, and exhibited numerous starch grains, fraudulently admixed, starch not being a constituent of poppy juice.

VI. *Sind* opium, No. 28; large crystals.

VII. *Hyderabad*, *Sind*.

VIII. Opium from *Candeish*, not distinctly crystallized, containing some starch.

IX. *Persian* opium, presented to the author by Mr. Howard (1872), highly crystalline, no starch.

X. *Egyptian* government opium, from Thebes, as exhibited in 1867, Paris Exhibition. Not distinctly crystallized.

XI. Opium produced in 1823 at Playford, Suffolk; containing large crystals.

XII. *English* opium, 1859, from Mr. Morson. Small crystals.

The process for the estimation of narcotine and morphine was that described in the "Pharmacographia," p. 59. The extract *a* of the following table is that afforded by means of boiling ether, with which the powdered opium had almost absolutely been exhausted by repeating the treatment with ether from about twenty to thirty times.

The extract remaining after the evaporation of the ether was boiled with acetic acid, 1.04 sp. gr. This liquid, after the acid had been driven off, yielded *b*, *crude narcotine*, as a crystalline brownish mass. It was washed with ether, and then afforded *d*, *purified narcotine*. Under *c*, the difference between *a* and *b*, representing the amount of *waxy matter*, is calculated. It includes also the oily matter, with which the Persian opium, No. IX., is impregnated, as well as a little wax in the case of sample I.

In exhausting the opium with ether a slightly yellowish fluid is obtained, which displays a *bluish fluorescence*, due to an unknown constituent of the drug.

Before precipitating the morphine, the aqueous solution was concentrated in order to get a smaller volume. It afforded *e*, the *crude dried morphine*, which, after twice or three times repeated recrystallization, finally furnished *f*, *purified morphine*. This purification of morphine cannot be performed without a loss of morphine; the real practical percentage of that alkaloid may therefore more correctly be regarded as somewhat superior to the figures *f*. It would be desirable to apply a process furnishing the exact percentage; yet

there is, as far as the author knows, no such method thoroughly satisfactory. He had been struck with the very large discrepancy, in the Indian opium, of the figures under *e* and *f*, which he thinks is larger than in opium from Asia Minor. Another fact well worth considering is the usually low percentage of morphine of Indian opium, narcotine being frequently present to a larger amount. This has already been pointed out in the "Pharmacographia," p. 57. It would appear, however, that this is of no consequence for the Chinese consumption, yet possibly it will be so some day if the home production of the Chinese further increases. Perhaps a more careful preparation of the Indian opium would at least prove of importance, not so much with regard to the smokers of the drug as to the possibility of extracting morphine from Indian opium profitably. It is not needful to point out that this would be highly desirable.

The results of the analyses just mentioned are the following :—

	I.	II.	III.	IV.	V.	VI.	VII.	VIII.	IX.	X.	XI.	XII.
a. Ethereal extract, i.e., residue dried after the evaporation of the ether.	24.2	21.7	22.0	20.6	14.1	17.4	20.4	—	25.0	23.7	18.1	23.6
b. Crude narcotine	10.0	9.0	8.5	7.6	7.6	8.0	9.7	—	10.2	12.2	9.3	11.6
c. Wax; difference between a and b	14.2	12.7	13.5	13.0	6.5	9.4	10.7	—	14.8	11.5	8.8	12.0
d. Purified narcotine	4.0	6.1	5.5	4.5	4.7	3.1	5.4	7.7	6.4	8.7	6.0	8.1
e. Crude morphine	11.2	11.2	14.1	10.6	14.4	—	—	—	—	—	—	—
f. Purified morphine	8.6	4.3	3.5	4.6	6.1	3.8	3.2	6.07	7.1	5.8	4.3	8.3

From these results it will be seen how great and exceedingly variable may be the difference between the amounts of crude and of purified morphine, and that a reliable method for the estimation of morphine in opium is still a desideratum.

On the use of Tannic Acid as a Styptic. L. Thomas. (*Brit. Med. Journ.* No. 721, 523.) Dr. Barnes and his disciples have so plainly demonstrated the value of styptic intra-uterine injections in cases of dangerous *post partum* hæmorrhage, that it is well worth trying other astringents than perchloride of iron, which, in spite of its undoubted efficacy, can hardly be said to be absolutely free from danger. In tannic acid we have a perfectly safe, non-irritating, easily portable remedy, and, moreover, one infinitely more cleanly than iron. Its action may be beautifully seen after abscision of the uvula or excision of the tonsils, when, if there be the least tendency to hæmorrhage, a few slowly swallowed sips of a saturated aqueous solution of tannin will immediately arrest all

bleeding, and the cut surfaces will be seen glazed over with a thin pinkish coating, which is, in fact, a tannate of albumen. An atomized inhalation of tannin acts almost magically in many cases of hæmoptysis; and there is every reason to believe that an injection, either in stream or spray, of a similar solution would act as beneficially in *post partum* hæmorrhage as it does in the instances quoted. If iron or nitrate of silver be applied to a stump or bleeding surface which it is necessary to watch, or where one may have to apply a ligature, their use is very confusing, as a black spongy mass is formed, almost impossible to remove. In such cases, and in all operations on the mouth and nose, or where ligatures are inconvenient or inapplicable, the use of tannin will be found most serviceable. Both the author's colleague, Mr. Lennox Brown, and himself, have used it with advantage after the removal of polypi from the ear, with the further result, so far as their experience goes, of diminishing the chances of recurrence of these very troublesome formations.

Rapid Evaporation of Ethereal Tinctures. Dr. G. Vulpinus. (*Archiv der Pharmacie*, 1874, i., 522.) The rapid evaporation of ethereal tinctures, etc., from narrow vessels may be effected in the following manner.

The ethereal tincture is introduced into a beaker or cylinder, and a glass siphon is arranged in such a manner that the short leg is suspended at a distance of not over one centimetre above the surface of the ethereal liquid, while the long leg may reach nearly to the floor. Slight suction at the latter aperture will cause the heavy ether vapour to be siphoned off from above the liquid, and the evaporation of the ether and removal of its vapour continues so rapidly, that at the summer temperature the ether will run off in drops if the long leg be surrounded by a layer of moist paper. The short siphon leg should be lowered in proportion as the ethereal liquid evaporates.

Some Physical Properties of Quinine. J. Regnaud. (*Journ. de Pharm. et de Chim.*, 4th series, xxi., 9.) The conflicting statements which have been published with reference to the behaviour of quinine to various solvents, have induced the author to reinvestigate this subject. The following is a summary of the results of his researches.

1. The solubility of quinine in water is, at 15° C., 1 in 2024, and at 100° C., 1 in 760; in absolute alcohol, at 15° C., 1 in 1133; in chloroform, at 15° C., 1 in 1926; in pure sulphuric ether, at 15° C., 1 in 22632.

2. The solubility of tannate of quinine in water is below 1 in 20,000.

3. The fluorescent power of quinine becomes twenty times more energetic under the influence of an excess of sulphuric acid.

4. By means of this exalted fluorescence, it is possible to recognize the presence of the alkaloid in a solution containing quinine only in the proportion of one part in five hundred thousand; a degree rather beyond that stated by Flückiger who recommends this reaction. The author finds it to surpass in delicacy, in the ratio of five to four, the opalescence caused by the double iodide of mercury and potassium, which, however, furnishes no clue as to the nature of the alkaloid of which it reveals the existence.

The Influence of Borax upon Fermentation and Putrefaction.

J. B. Schnetzler. (*Comptes Rendus*, lxxx., 473; *Pharm. Journ.*, 3rd series, v., 846.) 1. *Action of Borax upon the Protoplasm of Vegetable Cells.*

(a) Leaves of *Elodea Canadensis*, in the cells of which the protoplasm presents an easily observed rotatory movement, were plunged into a concentrated solution of borax. The plasmatic current continued for some minutes, then slackened and stopped completely. The protoplasm contracted, receded from the cell-wall, and condensed into one or two rounded masses containing grains of chlorophyl. The living matter of the cell had been killed by the borax.

(b) When fresh leaves of *Vaucheria clavata* were plunged intact into a concentrated solution of borax, the protoplasm was coagulated, and receded from the cell wall, which became perfectly transparent. The globules of chlorophyl were contracted and recurved, becoming crescent-shaped. When the spores of *Vaucheria* are transferred from the mother cell into water they execute some rapid movements by the aid of small vibratory hairs. In a solution of borax these movements were almost immediately arrested; the protoplasm of the spore contracted, and was transformed into a finely granular mass in the interior of the cell.

In a similar manner borax produced coagulation of the protoplasm in the spores of *Oidium Tuckeri* (the grape fungus), in the cells of yeast, moulds, etc.

2. *Action of Borax upon the Animal Organism.* (a) Infusoria, rotifera, and entomostraca, placed in water containing borax, quickly ceased to move, and then died; the contraction and coagulation of the sarcode of the infusoria being distinctly perceptible.

(b) The larvæ of frogs, rendered transparent by prolonged keeping in obscurity, when placed in the solution of borax manifested

convulsive contractions in the muscular fibres of the tail. The circulation of the blood slackened gradually, the plasma of the blood coagulated, and in less than an hour death took place.

The preceding observations showed that borax caused a cessation of the properties by which the life of vegetable and animal protoplasm is manifested. If, therefore, fermentation is a chemical phenomenon, accomplished under the influence of the life of the yeast, borax ought necessarily to act antagonistically to fermentation. To test the correctness of this inference some experiments were made upon the—

3. *Action of Borax upon Fermentable Matters.* (a) In October, 1872, some very ripe single grapes were placed in a concentrated solution of borax, together with an entire bunch, and kept in a closed vessel. The liquid, at first colourless, became slightly brown; but both the single berries and the entire bunch presented after two years the same appearance, whilst there was no trace of fermentation. Although, however, the grapes were well preserved, they were not eatable. Diffusion had taken place; a great part of the sugar had passed through the skin of the grape, whilst the borax had penetrated to the interior, where it had coagulated the albuminous matter of the cells. The same result was obtained with currants. When the flasks were well closed no trace of mould was seen; but when the air had either free or limited access, a mould (*mucor*) was formed, without fermentation, accompanied by disengagement of gas. When, as a counter test, grapes were placed in a well-closed vessel filled with ordinary water, after a time, according to the temperature, fermentation took place, with evolution of carbonic acid.

(b) Thirty cubic centimetres of fresh milk were placed in a test tube with one gram of borax. The cream quickly formed a rather thick layer in the upper portion. Notwithstanding the test tube was closed by a cork, a mould was formed upon the cream; but the remainder of the liquid underwent no acid fermentation, and retained during several months the appearance of very clear creamed milk. Afterwards, under the influence of summer heat the liquid became perfectly limpid, and deposited the casein as a soft white matter; but neither the deposit nor the liquid had an acid taste, and after three months they still had the odour of fresh milk. Fresh milk put into a well closed test tube without borax underwent acid fermentation in from two to three days, and became thick by coagulation of the casein.

(c) A piece of sheep's brain was powdered with borax. Eight

days afterwards it gave off a spermatic odour; later there was a disengagement of sulphuretted hydrogen without any appearance of putrefaction properly so called. The matter, after retaining a soft consistence during several months, became hard, and almost horny, without any disagreeable odour.

(d) A pound of beef was placed in a concentrated solution of borax, in a tin case not hermetically closed. The colouring matter of the blood diffused into the surrounding liquid as well as a portion of the soluble nitrogenous substance of the meat. After some weeks the liquid assumed a brown colour, and gave off a rather disagreeable odour, without any putrefaction of the meat. When the liquid was removed and the meat washed with cold water, it had an odour *sui generis*, but having no similarity to that of putrefying meat. After a year and a half, notwithstanding the heat of the summers of 1873 and 1874, this meat—the surrounding liquid having been renewed three times—had not the least odour of putrefaction. It was of a yellowish colour, but as soft and tender as fresh meat. Removed from the borax solution, the meat remained in the same state in the air.

(e) Beef, veal, and portions of sheep's brain were placed in a vessel which was filled with solution of borax and hermetically sealed. The liquid soon became clear red, and this colour remained during several months without alteration. The meat presented not the least disagreeable smell, as long as access of air was prevented. Meat placed in water in a flask hermetically sealed became rotten in a few days.

The peculiar odour of meat preserved in borax in contact with air the author considers to be due to the decomposition of matters which result from the metamorphosis of substances that constitute the muscular and intermuscular fibre. Although probably the use of borax will not be applicable to the preservation of meat for culinary purposes, the author considers that it may be economically substituted for alcohol in the preservation of anatomical specimens. Moreover, its power of suspending life in the lower organisms would seem to indicate its probable utilization in the treatment of wounds, etc.

Mucilage of Gum Arabic. Archer & Co. (*Amer. Journ. Pharm.*, 4th series, iv., 468.) With a view of giving greater stability to mucilage of gum arabic, the authors propose the substitution of tolu water for plain water, finding that a mucilage made with the former will keep well for several months.

The tolu water is prepared as follows:—

R. Tinct. Tolu (conc.)	3ij.
Magnes. Carb.	3iv.
Aquæ	Oij.

Mix the tincture with the carbonate of magnesium in a mortar, then add the water gradually, and filter.

The mucilage thus prepared has a faint odour and flavour of tolu, which is not objectionable, and in many cases might be advantageous. In appearance it is identical with the official.

Tolu appears to prevent changes in liquids upon the same principle and just as effectually as benzoin obviates rancidity in unctuous substances, and its preservative influence might be utilized in the preparation of many syrups and mixtures, which are remarkable for instability.

Benzoin, storax, or balsam of Peru, would no doubt prove as good a preservative as tolu, but the latter appears to be the least objectionable.

The Physiological Action of the Chinoline and Pyridine Bases.

John G. M'Kendrick and James Dewar. (Abstract of a paper read before the Royal Society; *Pharm. Journ.*, 3rd series, v., 868.) When either quinine, cinchonine, or strychnine is distilled with caustic potash, each of these substances yields two homologous series of bases, named the pyridine and chinoline series. Anderson and Greville Williams have shown that bases isomeric with these are also obtained by the destructive distillation of coal or from Dippel's oil. Greville Williams has also pointed out that chinoline obtained from coal-tar differs in some respects from that got from cinchonine. This suggested to the authors a research to ascertain (1) the physiological action of the various members of the series; (2) whether there was any difference in this respect between the members of the series obtained from cinchonine and those got from tar; and (3) whether, and if so, how, both as regards extent and character, the physiological action of these bases differed from that of the original alkaloidal bodies.

The bases in both series were separated from each other, as far as possible, by repeated fractional distillation. The substance first examined was chinoline (C_9H_7N) obtained from cinchonine. It was employed both as sulphate and hydrochlorate, dissolved in water, and introduced by subcutaneous injection into the animal. The strength of the solution in this and in all other instances was one part of the base to twenty parts of water. Its physiological action was tested on frogs, mice, rabbits, guineapigs, cats, dogs, and man; but as the effects were found to be similar in all of these

instances, the majority of the observations were made on rabbits. The action of hydrochlorates of the bases distilling off at higher temperatures, including such bases as lepidine ($C_{10}H_9N$), dispoline ($C_{11}H_{11}N$), tetrahiroline ($C_{12}H_{13}N$), etc., was next studied by the same method. The pyridine series was then examined, beginning with pyridine (C_5H_5N) itself, and passing upwards to bases obtained at still higher boiling points, such as picoline (C_6H_7N), lutidine (C_7H_9N), collidine ($C_8H_{11}N$), parvoline ($C_9H_{13}N$), etc. Lastly, the investigation was directed to the action of condensed bases, such as dipyridine ($C_{10}H_{10}N_2$), parapicoline ($C_{12}H_{14}N_2$), etc.; and the effects of these substances were compared with those produced by the members of the chinoline series and among themselves. So far as could be observed, there was no difference as regards physiological action between bases obtained from cinchonine and others got from tar. The general conclusions arrived at were—

1. That there is a marked gradation in the extent of physiological action of the members of the pyridine series of bases, but it remains of the same kind. The lethal dose, however, becomes reduced as we rise from the lower to the higher.

2. The higher members of the pyridine series resemble, in physiological action, the lower members of the chinoline series, except that the former are more liable to cause death by asphyxia, and that the lethal dose of the pyridines is less than one half that of the chinolines.

3. In proceeding from the lower to the higher members of the chinoline series, the physiological action changes in character, inasmuch as the lower members appear to act chiefly on the sensory centres of the encephalon and the reflex centres of the spinal cord, destroying the power of voluntary or reflex movement; while the higher act less on these centres, and chiefly on the motor centres, first as irritants, causing violent convulsions, and afterwards producing complete paralysis. At the same time, while the reflex activity of the centres in the spinal cord appears to be so far inactive as not to be excited by pinching or pricking, it may be readily roused to action by strychnine.

4. On comparing the action of such bases as C_9H_7N (chinoline) with $C_9H_{13}N$ (parvoline), or $C_8H_{11}N$ (collidine) with $C_8H_{15}N$ (conia from hemlock), or $C_{10}H_{10}N_2$ (dipyridine) with $C_{10}H_{14}N_2$ (nicotine from tobacco), it was observed that, apart from differences in chemical structure, the physiological activity of the substance was greater in those bases containing the larger amount of hydrogen.

5. Those artificial bases which approximately approach the

percentage composition of natural bases are much weaker physiologically, so far as can be estimated by amount of dose, than the natural bases; but the kind of action is the same in both cases.

6. When the bases of the pyridine series are doubled by condensation, producing dipyridine, parapicoline, etc., they not only become more active physiologically, but the action differs in kind from that of the simple bases, and resembles the action of natural bases or alkaloids having an approximately similar chemical composition.

7. All the substances examined in this research are remarkable for not possessing any specific paralytic action on the heart likely to cause syncope; but they destroy life, in lethal doses, either by exhaustive convulsions or by gradual paralysis of the centres of respiration, thus causing asphyxia.

8. There is no immediate action on the sympathetic system of nerves, although there is probably a secondary action, because after large doses the vaso-motor centre, in common with other centres, becomes involved.

9. There is no appreciable difference between the physiological action of the bases obtained from cinchona and those derived from tar.

Sulphovinate of Quinine for Hypodermic Solutions. Dr. P. Jaillard. (*Répert. de Pharm.*, iii., 102; *Pharm. Journ.*, 3rd series, v., 909.) The author, after alluding to the limitation in the practice of administering quinine hypodermically in consequence of the inconvenience sometimes arising from the slight solubility of the salts usually employed, states that this difficulty may be entirely avoided by the use of either an acid or neutral sulphovinate of quinine.

The acid sulphovinate of quinine, which has been described by Schlagdenhauffen, is white, difficultly crystallizable, and very hygroscopic. It is rapidly altered by heat, and contains only 56.25 per cent. of quinine. It is obtained by the reaction between 54.8 parts of acid sulphate of quinine, and 42.3 of sulphovinate of baryta, both salts being previously dissolved in distilled water. The liquid is filtered to separate sulphate of baryta, and then gently concentrated by means of a water bath.

The neutral sulphovinate of quinine is, however, the salt specially recommended by the author; it being non-hygroscopic and slightly alkaline, and containing a large proportion of quinine, viz., 72.16 per cent. It is white, solid, and crystallizes in silky non-deliquescent tufts. It is very soluble in water and in alcohol, and is insoluble in ether.

An aqueous solution of the neutral sulphovinate, prepared with one part of sulphovinate, and two parts of distilled water, keeps perfectly at an ordinary temperature. It does not exhibit the fluorescence of the solution of the sulphate; it has a bitter taste, and perceptibly blues red litmus paper.

The neutral sulphovinate can be prepared by adding 8·71 grams of ordinary sulphate of quinine to a boiling solution of 4·27 grams of sulphovinate of baryta in 100 c.c. of distilled water. After boiling some time the whole is thrown upon a filter, and the clear liquor is tested to ensure that the double decomposition has been complete. If the examination should demonstrate that either of the salts is in excess, it is indispensable that such excess should be decomposed by the careful addition of a sufficient quantity of the other salt. The solution is afterwards evaporated by the aid of a water bath until it is reduced to an oily liquid, which upon cooling forms a crystalline mass. This should be dried either by submitting it to pressure, or by placing it under a glass over quicklime, before reducing it to powder. This salt may be used in the preparation of hypodermic injections, as follows:—

R	Neutral sulphovinate of quinine . . .	1 gram.
	Distilled water	2 "
	Dissolve with the aid of a gentle heat.	

Sulphovinate of soda may be used instead of sulphovinate of baryta in the preparation of this salt, operating in the presence of alcohol. But the product thus obtained is not so soluble as the former, and requires for its solution four parts of water instead of two.

An Improved Apparatus for Fractional Distillation. J. A. Le Bel and A. Henniger. (*Ber. deut. Chem. Ges.*, vii., 1084–1086; *Journ. Chem. Soc.*, 2nd series, xiii., 128.) The apparatus, which it is not easy to describe without the aid of the figure, consists of a tube having two or more bulbs blown upon it. The lower end of the tube is inserted into the neck of the flask in which the liquid is boiled, whilst from near the upper extremity a lateral tube conveys away the vapour to the condenser. Immediately below each bulb there is a slight contraction, so that, as the less volatile constituents of the vapour condense in passing through the bulbs, the liquid formed may lodge there, and the vapour, in order to pass higher, must bubble through it. The accumulation of the liquid in the bulbs beyond a certain height is prevented by sealing into the lower part of each bulb a narrow tube, which, curving downwards in the

form of an inverted siphon, carries the excess of condensed liquid into the bulb beneath.

In the hands of the authors this apparatus has been found very effective.

Mistura Assafœtidæ and Mistura Ammoniacy. J. W. Wood. (*Amer. Journ. Pharm.*, 4th series, iv., 309.) As these preparations do not keep, and are rather troublesome to make at a moment's notice, the writer suggests the use of mixtures of the gum resins with glycerin, which will keep well, and only require the addition of the requisite amount of water for the immediate production of the above mixtures. The following formula is recommended :—

R	Assafœtidæ electæ	3ij.
	Glycerinæ puræ	3vj.

Cut the assafœtida into small pieces, add the glycerin, introduce into a capsule, and subject to a moderate heat, constantly triturating with a pestle. In a short time the solution will be effected, and the result will be a liquid, not too thick for easy manipulation, each troy dram of which will represent fifteen grains of the gum resin. Transfer to a wide-mouth bottle, and label according to contents.

The only extra precaution necessary in preparing the glycerole is to guard against employing too great a degree of heat, so that the volatile oil may not be dissipated.

Mistura ammoniaci is prepared in precisely a similar manner as the foregoing, the proportions being the same, and the result being equal, if not superior, to that made by the officinal formula. It certainly, in point of convenience and facility, possesses a decided advantage.

Purification of Water. Dr. John N. Niglas. (*Pharmacist*, Dec. 1874, p. 353.) Dr. Keletzinsky, of Vienna, has devised a method the merit of which is substantiated by the fact that the authorities who have in charge the department of public health in the Austrian capital, have adopted the same for general use.

The writer is indebted to Dr. Charles Brants, president of the Vienna Pharmaceutical Union, for the following details of the process adopted.

- Take of Phosphate of aluminum, one part.
- Perphosphate of iron, two parts.
- Phosphate of magnesium, two parts.
- Phosphoric acid (officinal) sufficient quantity.

The freshly prepared phosphates of aluminum, iron, and magnesium, are dissolved in the solution of the phosphoric acid, with

the aid of a gentle heat. The solution thus obtained is filtered through paper, and in this state can be kept on hand for any length of time. When required as a purifying agent for drinking water, add the phosphatic liquor small quantities at a time to the water, until no further cloudiness is produced; let stand so as to allow the precipitate that has been formed to settle, and use the clear water. The process is explained thus: The lime salts usually contained in water, will partially abstract the phosphoric acid to form phosphate of lime, while the iron, alumina and magnesia, being thus deprived of their solvent, will at once be thrown out of solution, and chemically unite with, or mechanically carry down, such impurities as may exist in the water operated upon.

The phosphate of magnesium takes up the free ammonia, the oxide of iron combines with the sulphydric acid and other gaseous products of decomposition, while the alumina and the phosphate of lime will mechanically drag down such suspended particles of impurities as the water may be impregnated with.

The addition of a slight excess of the phosphatic liquor, is in no way objectionable to the animal economy, and therefore no fears need be set up on this account.

The phosphoric acid of the Pharmacopœia Austriaca contains sixteen per cent. of anhydrous acid.

Admixture of Japan Wax with Beeswax. C. Mène. (*Comptes Rendus*, lxxxviii., 1544; *Pharm. Journ.*, 3rd series, v., 25.) For some years past Japan wax has been offered in the ordinary French markets, where it is quoted at a price less than half that of beeswax. The author, finding that it was used largely in the sophistication of beeswax, thought it would be useful to seek a short and easy method of detecting the fraud. He therefore made numerous experiments as to the densities and melting and solidifying points of these substances, and mixtures of them in different proportions. The results, from which the following notes are taken, were recently communicated to the French Academy.

	Density.	Melting point.	Solidifying point.
Pure Yellow Japan Wax	1.00200	52-54° C.	45-46° C.
Beeswax	0.96931	64-65	63-64
Mixtures :—			
50 per cent. Japan Wax } 50 „ Beeswax . }	0.93518	64-65	61-62
60 „ Japan Wax } 40 „ Beeswax . }	0.92785	64-65	61-62
65 „ Japan Wax } 35 „ Beeswax . }	0.90730	64-65	61-62

Mixtures:—			Density.	Melting point.	Solidifying point.
70 per cent.	Japan Wax	}	0.90452	63–64° C.	61–62° C.
30	Beeswax				
75	Japan Wax	}	0.90164	63–64	62–63
25	Beeswax				
80	Japan Wax	}	0.88703	63–64	62–63
20	Beeswax				
90	Japan Wax	}	0.85100	63–64	62–63
10	Beeswax				

The densities of these substances were taken in alcohol, and their relation to the density of water calculated. As will be noticed, the density alone furnishes any help in detecting the fraud, the density of the mixture being always less than that of Japan wax or beeswax. The author, therefore, thinks that the points of melting and solidification are of no service whatever.

It will be remembered, however, that Dr. Roucher, in an article on the employment of vegetable wax in pharmacy (*Pharm. Journ.*, 3rd series, iii., 122), stated that he had found that Japan wax has two distinct melting points. As to the highest, he agrees with M. Mène in fixing it at 54° C.; this he states to be the melting point when the heat is applied gradually. But when Japan wax was rapidly raised to a temperature sufficiently above its melting point, and allowed to cool, it afterwards melted at 42° C., or a temperature twelve degrees lower. As beeswax presents no similar phenomenon, Dr. Roucher suggested that this would be an available test between the two substances. It would be interesting to know in what way mixtures of the two substances comport themselves under similar conditions.

Rapid Assay of Cinchona. M. Herbelin. (*Journ. de Pharm. et de Chim.*, June, 1875, p. 295; *Chem. and Drug.*, 1875, p. 218.) Numerous processes have been suggested for the estimation of quinine in bark. The writer thinks that the following, being extremely simple, should find favour with pharmacutists. Ten grams of cinchona, reduced to coarse powder, are moistened with 30 grams solution of ammonia, and the two well mixed with the aid of a glass rod. Thirty grams of benzine are now poured upon the pasty mass, and the solution of the quinine is favoured by agitation. After a few minutes the benzine is decanted into a 200 c.c. flask; the operation is repeated four or five times, or oftener if necessary. Fifty grams of a five per cent. aqueous sulphuric acid are added to the benzine solution, and agitated; a few minutes suffice to convert the whole of the quinine into sulphate. The aqueous liquid, freed from benzine by decantation, is now precipitated by

ammonia, and the quinine dried and weighed. The operation may be completed within an hour; it requires no particular apparatus, and is inexpensive, the benzine serving for several operations.

Tincture of Phosphorus. R. H. Condrey. (*Pharmacist*, April, 1875, p. 98.) The main object of the writer's investigation was to determine the extent to which phosphorus is dissolved by alcohol. His experiments lead him to the following conclusions:—

1. Alcohol of sp. gr. 0.822 dissolves, at common temperatures, 0.25 per cent. of phosphorus, equal to 0.93 grains in each fluid ounce. Alcohol sp. gr. 0.835 dissolves, at common temperatures, 0.18 per cent. of phosphorus, equal to 0.64 grain in each fluid ounce. Glycerin sp. gr. 1.26 dissolves, 0.17 per cent. of phosphorus, equal to 0.12 grain in each fluid dram, or 0.96 grain in each fluid ounce.

2. Phosphorus in alcoholic solution undergoes oxidation when in contact with air; light has a tendency to facilitate oxidation, therefore it should be protected as much as possible from the light, dark coloured bottles being preferred for its keeping.

3. When an excess of phosphorus is kept in the tincture, the fluid will always contain practically the same amount of free phosphorus; phosphoric acid, on the contrary, will vary in amount with the exposure of the tincture.

4. The tincture is incompatible with syrup or any other aqueous solution, as these precipitate phosphorus; it should not therefore be administered in such vehicles; it may, however, be mixed with glycerin in all proportions.

5. The tincture is best prepared as follows: Take of phosphorus scraped clean, one stick; commercial alcohol, thirty-two fluid ounces. Allow these to remain in contact a week at least, at a medium temperature, decant as needed, and keep in the dark or in dark coloured bottles.

Purification of Oleic Acid. Chas. Rice. (*Proceed. Amer. Pharm. Association*, 1874.) The desired aim is to obtain an acid which is liquid at ordinary temperatures, and is as free as possible from oxyoleic acid and colouring matter. After many trials and failures the author succeeded in obtaining a satisfactory result by the following process.

Take of commercial oleic acid ("red oil") any convenient quantity. Expose it repeatedly to a temperature of about 45° F., and express the liquid portion.* Mix this with an equal bulk of sulphurous

* Dr. E. R. Squibb stated to the writer that he finds it preferable to cool the crude acid first to 60° F., the liquid product of this to 50° F., and the remaining liquid product to 45° F.—C. R.

acid solution, place it in the light, and shake frequently until no more colour is discharged. A crude acid, which was prepared from clean and fresh fats, and collected as the first run from the hydraulic press, before the pressure had been raised high, will discharge nearly all its colour; generally, however, the result is an acid of a light straw colour. Finally the oleic acid is separated, washed repeatedly with cold distilled water, and put into bottles, which should be kept full and in a cool place. Oleic acid thus prepared dissolves metallic oxides readily and completely, and mercuric oxide without reduction.

In making oleate of mercury, it is essential to use only such mercuric oxide as is *thoroughly dry*, and to sift it in small portions at a time upon the surface of the oleic acid, each fresh portion being well incorporated before another is added. Only in this way can an intimate mixture be made of the acid and the oxide, which latter has a great inclination to cake, thereby diminishing the surface upon which the acid could act. Solution should be promoted by frequent stirring, at ordinary temperatures, since experience has shown that all heating is positively injurious.

Antagonism between Strychnia and Chloral Hydrate. Dr. J. H. Bennett, F.R.S.E. (From the report of the committee of the British Medical Association; *Brit. Med. Journ.*, No. 718.) In this investigation one hundred and fourteen experiments were performed, the results of which lead to the following conclusions.

1. After a fatal dose of strychnia, life may be saved by bringing the animal under the influence of chloral hydrate.
2. Chloral hydrate is more likely to save life after a fatal dose of strychnia, than strychnia is to save life after a fatal dose of chloral hydrate.
3. After a dose of strychnia has produced severe tetanic convulsions, these convulsions may be much reduced both in force and in frequency by the use of chloral hydrate, and consequently much suffering saved.
4. The extent of physiological antagonism between the two substances is so far limited, that a very large fatal dose of strychnia may kill before the chloral hydrate has had time to act; or the dose of chloral hydrate must be so large in such a case to antagonize the fatal dose of strychnia that there is danger of death from the effects of the chloral hydrate.
5. Chloral hydrate mitigates the effects of a fatal dose of strychnia by depressing the excess of reflex activity excited by that substance; while strychnia may mitigate the effects of a fatal dose of chloral

hydrate by rousing the activity of the spinal cord, but it does not appear to be capable of removing the coma produced by the action of chloral hydrate on the brain.

The Action of Iodine upon Rhubarb. C. Husson. (*L'Union Pharmaceutique*, xvi., 99; *Pharm. Journ.*, 3rd series, v., 950.) When a specimen of rhubarb in lump is examined, the physical characters described by Cauvet (*Pharm. Journ.*, 3rd series, ii., 1009), are nearly always sufficient for the purpose of recognizing the quality and source of the drug. When, however, the examination is made of a sample in powder, the physical characters are insufficient, and the chemical properties leave much in doubt. In this latter respect the author thinks it would be of service to place on record some observations as to the phenomena that occur when rhubarb is submitted to the action of tincture of iodine. Like nearly all vegetable substances, rhubarb is capable of taking up a considerable proportion of iodine. The causes of this absorption are numerous, and the alkaline salts take their part in the phenomenon; but it is incontestable that the organic matters are also concerned in it.

The test liquor used by the author was a tincture of iodine (one in forty), added by means of a burette graduated to $\frac{1}{20}$ of a c.c. The experiments were made upon picked specimens, in which the physical characters were clearly recognized whilst whole, and which were afterwards reduced to a fine but not impalpable powder. The method adopted for testing was to suspend five grams of powder in 125 grams of distilled water, which was afterwards evaporated in a porcelain capsule to one half, with continual stirring. It was then poured without filtering into a white phial, and restored to the original volume, care being taken to wash the capsule with a little water to remove adhering particles. To this liquor, when cool, iodine was added, until it gave a blue colour with starch mucilage. As at the close of the operation it was difficult to recognize the starch reaction because the liquid was turbid, this was ascertained by removing a drop or two of the liquid by means of a glass rod from the phial, and letting it fall on some starch mucilage placed in a porcelain plate.

China Rhubarb, flat variety.—The convex surface presented the white lines disposed in a delicate network, mentioned by Cauvet; the under surface also showed the stars indicated as characteristic. It crackled under the teeth, and was hard and compact. Five grams of the powder treated by the above process, gave a beautiful yellow-brown decoction, which, heated with the tincture,—

Absorbed without changing colour	14 c.c.
Changed colour with	17 „
Became dirty green with	23 „
Gave freely a blue colour with starch, with	25 „

or after having neutralized 0·625 gram of iodine. Thus 100 grams of this rhubarb would absorb 12·50 grams of iodine.

If the decoction were allowed to stand after the operation, it was remarked that the liquid portion separated with difficulty from the insoluble matters. At the end of twenty-four hours it formed two layers, the upper of a dark brown colour, the lower of a greenish brown, separated by a greenish blue line.

If instead of boiling the rhubarb it was allowed to macerate twenty-four hours in 100 grams of distilled water, stirring it every hour for the first twelve hours, about one half the quantity of iodine was absorbed.

China Rhubarb, round variety.—This rhubarb presented the same white network as the preceding; the interior, although more porous, was far from being spongy. The absorbent power of this specimen was greater than the former, as the decoction did not give a blue colour with starch until it had neutralized 29 c.c. of tincture, or equal to 14·50 grams of iodine to the 100 grams of rhubarb. After standing, the liquid separated into two layers: the upper of a fine yellow-brown colour, the lower of a rather dirty yellow.

It may be admitted that this rhubarb, having the same origin as the former, belonged to an older plant. The starch had become transformed, thus augmenting the porosity and absorbent power of the rhubarb. It follows that although less handsome than the preceding it is more active, provided that it has not become altered. The product obtained by simple maceration neutralized seven grams of iodine per 100 grams of rhubarb, or about half the proportion neutralized by the decoction.

Russian Rhubarb.—The specimen experimented upon presented the characters indicated by Canvet. The interior was of a dark yellow colour, veined at the centre in white and red. The colour of the decoction was a rather redder brown than the preceding. Upon the addition of the tincture of iodine it,—

Changed colour with	10 c.c.
Became bottle-green with	12 „
Became a deep greenish blue with	17 „
Gave a strong blue colour with starch mucilage with	20 „

Hence 100 grams of this rhubarb would neutralize 10 grams of

iodine. Upon standing, the liquor quickly formed two layers; the upper layer was of a greenish yellow colour, the insoluble portion was greenish blue. The product of maceration absorbed 5.5 per cent. of iodine, or little more than half as much as the decoction.

French Indigenous Rhubarb.—The specimen used was a very fine one, the decoction neutralized ten per cent. of iodine, or as much as the Russian rhubarb. It was distinguished from the other, however, by the phenomena which accompanied the absorption of the iodine. The first drops of the tincture upon coming into contact with the liquor coloured it blue immediately, which did not occur with the other rhubarbs. This colour disappeared quickly upon agitation. After adding of the tincture of iodine,—

- 8 c.c. the liquor remained of a dull colour.
- 10 „ it acquired a bottle-green colour.
- 11 „ it acquired a blue-green colour.
- 12 „ it acquired a blue-black colour.
- 20 „ it blued starch strongly.

Upon standing, the liquor separated into two not very distinct layers; the upper being green, nearly black, the lower quite black. The product of maceration absorbed 5 per cent. of iodine.

The differences above indicated the author considers to be sufficiently distinct to assist in recognizing the nature of a rhubarb, whilst not neglecting known methods. He believes, in fact, that the greater the proportion of iodine neutralized before any change in the colour of the decoction is manifested, the more certainty there will be that a rhubarb is of good quality. On the contrary, the less the proportion of iodine required to produce a greenish tint in the liquid, and to give afterwards a blue-black residue, the poorer would be the quality of the rhubarb.

One practical consequence of these reactions which the author points out, is the possibility of having a certain number of iodized preparations, in which the iodine is completely masked by the organic matter. Thus it would be easy to prepare an extract of rhubarb containing a considerable quantity of iodine, which would not be driven off from the combination under the influence of heat. He suggests the following formula for a syrup of iodized rhubarb, which would contain five grams of iodine per litre:—

Macerate for twenty-four hours 100 grams of Chinese rhubarb, coarsely powdered, in 400 grams of water. Strain, press, and wash the residue with 100 grams of water. Filter so as to collect 400 grams of liquid. Add gradually a quantity of tincture containing five

grams of iodine as concentrated as possible. Dissolve in it 800 grams of sugar, and afterwards strain.

Gums and Mucilages. M. Giraud. (*Comptes Rendus*, lxxx., 477; *Pharm. Journ.*, 3rd series, v., 766.) The author has recently communicated to the French Academy the results of a comparative study of some gummy substances which swell in water, particularly of gum tragacanth, in which he has sought to ascertain the differences which exist between these bodies and the gums properly so called.

With the exception of gum arabic, the curious composition of which has been indicated by Fremy, the investigation of all the other gums remains incomplete. Although the gums and the organic substances which swell in water present points of physical resemblance, the author states that there exist considerable chemical differences between them, and that amongst the latter class there occur very clearly distinctive characters.

As the result of his researches, M. Giraud has found that the mucilaginous substances which swell in water may be divided into three groups. In the first he places gum tragacanth, characterized by the presence of a body capable of forming pectic compounds. To the second belong the mucilages, containing no pectic principles, which are rendered insoluble in water by the weakest acids. This group is represented by the mucilage of the quince, which contains a considerable quantity of cellulose (20 per cent. of the dry mucilage) that can be isolated by the prolonged action with heat of acids, or even concentrated alkalis. The third group comprises the mucilaginous bodies, devoid like the preceding of pectic compounds, which are not precipitated by dilute acids, but are transformed rapidly by heat into a substance comparable to dextrine and a saccharine substance.

These different bodies have the common property of becoming transformed under the more or less prolonged action of dilute acids and heat into a sugar differing from ordinary glucose. This sugar crystallizes readily, does not ferment, and possesses a more energetic reducing power than glucose. It appears to belong to the class of sugars named by Berthelot "galactoses."

Having established this classification, M. Giraud proceeded to the investigation of them successively, commencing the chemical examination with one of the most important, gum tragacanth, the composition of which he describes as follows:—

Gum tragacanth is very slightly soluble in cold water; it is far from giving, as has been stated, 30 to 50 per cent. of soluble gum.

The filtered product is a mixture of different bodies, and not a definite principle, like arabin. When it is digested in a water bath with fifty times its weight of water, after about twenty-four hours all the gummy substance is converted into soluble gum, having lost the property of swelling after drying. This new substance is not arabin, as has been asserted, but pectin. Submitted to the action of acidulated water (one per cent.) in a water bath, this gum is modified after two or three hours, becoming entirely soluble. The new product is not arabin, but principally pectin, and combines with alkalies to form pectates and metapectates; it is precipitable by alcohol. The quantity of glucose formed during this action scarcely corresponds to one tenth of the matter employed.

For the foregoing reasons the author came to the conclusion that gum tragacanth contains more than one half of its weight of a pectic principle insoluble in water which appears identical with that named by Fremy pectose, and exists in the utricular tissue of fruits and roots.

These facts being established, the author proceeded to the preparation of some pectic acid from this source. For this purpose some tragacanth was digested with fifty times its weight of water, containing one per cent. of hydrochloric acid, in a water bath until dissolved; it was then filtered, and excess of baryta water added. The precipitate, which formed slowly, was pectate of baryta. When of a suitable consistence, this was washed, suspended in water, and treated with excess of hydrochloric or acetic acid, which left a precipitate of pure pectic acid. As the result of numerous determinations it was found that by this method about 60 per cent. of pectic acid can be obtained from gum tragacanth. Some analyses of the pectic acid so produced, and of the pectates of lead and baryta prepared with it, gave results which agreed closely with the numbers obtained by Fremy in his investigation of pectic acid obtained from fruits.

Having thus ascertained the nature of the principal compound contained in gum tragacanth, the author proceeded to ascertain the percentage composition of the gum, which he found to be as follows:—

Water	20
Pectic compound	60
Soluble Gum	8 to 10
Cellulose	3
Starch	2 to 3
Mineral matters	3
Nitrogenous bodies	traces.

This result, he considers, establishes sufficiently clearly the chemical constitution of gum tragacanth, and the characters which distinguish it from other gums.

Ergot for Hypodermic Injections. Dr. Wernich. (*Apotheker-zeitung*, 1874, No. 17.) A very active preparation of ergot which is particularly adapted for subcutaneous injection, may be obtained by the following process:—

The ergot is exhausted successively with ether, strong alcohol, and water; the mixed infusion is then dialyzed through parchment paper, and the solution evaporated. This extract, after acidulation with sulphuric acid, is mostly soluble in alcohol, and when again carefully neutralized by soda, yields to weak alcohol all its active properties. The subcutaneous injection is followed by a prompt action, and is attended with little or no inconvenience.

Compressed Powders. Prof. Rosenthal. (*Berliner klin. Wochenschrift*, 1874; *Amer. Journ. Pharm.*, 4th series, v., 171.) The author recommends to compress bulky powders which have to be taken in large doses; for instance, koussou, and other worm medicines.

He does this by means of a common press (vertical), the lower cross-piece of which is provided with a hole, which can be covered by a plate. A tube is put on top of this plate, and the several doses of the powder are introduced, separated by small metal cylinders. Strong pressure is now applied, the above-mentioned plate is removed, and the compressed powder tablets fall through the hole in the cross-piece. It will be seen that since no water or other constituent is used, the said tablets must dissolve readily in the stomach.

Preservation of Medicinal Preparations by Filtered Air. Prof. A. Almén. (*Archiv for Pharmaci og teknisk Chemi med deres Grundvidenskaber*, 1875; *Amer. Journ. Pharm.*, 4th series, v., 170.) The author has instituted a series of experiments, which confirm the observations of Dusch and Schröder (see *Amer. Journ. Pharm.*, 1854, xxiv., 376) and those of Folberth (*ibid.*, 1862, xxxiv., 336), respecting the possibility of keeping infusions, decoctions, and similar (under ordinary circumstances easily spoiled) preparations for years. This is done by combining the method of Appert with the use of a cotton plug. The preparation to be preserved is heated to the boiling point, and stoppered with cotton-wool. If not all the contents of a bottle have to be used at once, the cotton plug should be replaced by a cork, through which passes, first, a short tube (the nethermost end of which is drawn out

to a point), filled loosely with cotton-wool; and then, a siphon, the long end of which is furnished with a gum-elastic tube and spring-compressor. This arrangement is, of course, to be applied before heating. As the liquid is drawn off, the air filters through the cotton.

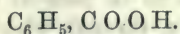
The bottles have to be rinsed with *boiling* water, since cold water contains germs, on the presence of which fermentation and putrefaction depend.

The Antiseptic Action of Salicylic Acid. Dr. R. Godeffroy. (Abstract of a paper read before the Austrian Pharm. Soc., and published in the *Zeitschrift des allgem. österr. Apothekerver.*, April 20, 1875; *Pharm. Journ.*, 3rd series, v., 865.) Salicylic or spiroylic acid, is an acid of the group of so-called aromatic compounds, and is represented by the formula $C_6H_4 \begin{Bmatrix} OH \\ COOH \end{Bmatrix}$. It occurs in the leaves of *Spiræa Ulmaria* (hence one of its names), also, combined with methyl, as one of the chief constituents of oil of wintergreen (*Gaultheria procumbens*), and of the essential oil of *Monotropa Hypopithys*.

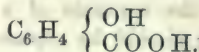
Salicylic acid may be prepared in different ways. It is obtained by the oxidation of salicin, a nitrogenous body contained in willow bark (cortex salicis), and by the oxidation of saligenin. It is also produced by the heating of oil of gaultheria with potassium hydrate, and the decomposition of the resulting potassium salicylate by means of hydrochloric acid. But it is more simply obtained by the treatment of sodium carbolate with carbonic acid; sodium salicylate is thereby formed, which being decomposed by hydrochloric acid, yields sodium chloride and a thick paste of precipitated salicylic acid. By repeated recrystallizations from hot water, the salicylic acid can be almost perfectly purified.

Prepared in this manner, salicylic acid forms odourless and colourless, or sometimes yellowish, four-sided prisms of somewhat sweetish acid taste. It melts at $150^{\circ}C$. and sublimes when carefully heated, without decomposition. Heated rapidly beyond the melting point, it is decomposed into carbolic and carbonic acids. In cold water, salicylic acid is only slightly soluble, but it is freely soluble in boiling water, alcohol, ether, and glycerin.

Salicylic acid may from its composition be considered to be an oxidation product of benzoic acid, since it contains exactly one atom of oxygen more than benzoic acid, as is shown by the following formulæ:—



Benzoic Acid.



Salicylic Acid.

Three such isomeric acids, formed by the oxidation of benzoic acid are now known: (1) oxybenzoic acid; (2) salicylic acid; (3) paraoxybenzoic acid. Salicylic acid and its salts differ from the other two by giving a splendid violet colour with solution of ferric chloride. Oxybenzoic acid is obtained by the action of nitric acid in a boiling solution of amidobenzoic acid; paraoxybenzoic acid by the fusing of anisic acid, paracresol, and certain resins, such as benzoin, aloes, etc., with caustic potash. But it is more remarkable that it is formed also by the fixation of carbonic acid on potassium carbolate, in a manner analogous to the formation of salicylic acid by the fixation of carbonic acid on sodium carbolate.

The knowledge that salicylic acid could be readily formed from carbonic and carbolic acids, and that by heat it could be split up again into those two acids, led to the expectation that, similarly to carbolic acid, it would retard, if it did not prevent, fermentative and putrefactive processes, and act generally as an antiseptic. In this direction Professor Kolbe, of Leipzig, especially has made experiments which have demonstrated that in salicylic acid has been discovered an important and valuable antiseptic. Without smell or notable taste, and not poisonous, in antiseptic power it does not come short, but in many cases even surpasses carbolic acid. Several of these experiments have been described in the *Pharmaceutical Journal* (v., 421).

Knop also has investigated the action of salicylic acid upon vegetation, and found that it exercises a very perceptible influence upon the vegetative activity of the chlorophyl cells of the higher orders of plants, and the chromule cells of the lower orders, so long as free acid remains in the solution. But this action disappears as soon as the greater part of the acid becomes saturated by the ammonia which is formed by the resulting decomposition of the albuminous compounds. This agrees with the observations of Kolbe, that the antiseptic action of salicylic acid is not shared by its salts, nor by its isomers oxybenzoic and paraoxybenzoic acids.

Dr. Godeffroy has made, in the laboratory of the Vienna Pharmaceutical School, a series of experiments, chiefly in the direction of the antiseptic action of salicylic acid upon syrups, the results of which essentially confirm those of other authors. The following are some of the details:—

Fifty grams of syrupus mororum were diluted with 50 grams of water, and exposed in an open vessel at a temperature of 18° to 22° C. On the other hand, 50 grams of the same syrup and 50 grams of water containing 0.024 gram of salicylic acid were exposed in

another vessel at the same temperature; and finally, 50 grams of the syrup and 50 grams of water containing 0.04 gram of salicylic acid were also left to stand in an open vessel. After eight days the mulberry juice diluted with water containing no salicylic acid was completely sour, whilst that diluted with water containing 0.024 gram of acid first became sour after twenty-four days, and the syrup exposed with 0.04 gram of acid on the 8th March had not become sour at the time of writing (20th April).

Fifty grams of *syrupus emulsivus* (*syrupus amygdalarum*) were diluted with 50 grams of water containing 0.0475 gram of salicylic acid, and exposed in an open vessel at a temperature of 18° to 22° C. Other portions of similar strength were mixed with 0.11, 0.238, and 0.36 gram of acid respectively, and the whole were exposed in open vessels, together with one portion containing no salicylic acid, on the 8th March. The portion of diluted syrup containing no salicylic acid became sour in four days, that containing 0.0475 gram became sour in ten days; the other portions had not become sour at the time of writing.

Thirty grams of *syrupus fœniculi* were mixed with 30 grams of water, 0.113 gram of salicylic acid added, and exposed in an open vessel at a temperature of 18° to 22° C. On the thirtieth day it was still completely fresh and good, whilst a similar mixture without salicylic acid became sour in eight days.

Thirty grams of *syrupus menthæ* were mixed with 30 grams of water, and exposed in an open vessel at a temperature of 18° to 22° C. On the tenth day this mixture was sour, whilst a similarly prepared mixture of syrup and water, to which 0.113 gram of salicylic acid had been added, remained quite fresh on the thirtieth day.

The experiments on syrups are still being carried on in the author's laboratory, and he hopes to be able to lay down a general rule for the addition of salicylic acid.

In order to compare the strength of the antifermentative property of salicylic acid with that of carbolic acid, Dr. Godeffroy also made the following further experiments:—

One gram of fresh yeast from a brewhouse was mixed with 13 grams of flour and 10 grams of water into a paste. In five minutes the dough began to swell, and in ten minutes had finished rising. This took place more rapidly still in a drying closet at 20° to 30° C.

Other portions of dough were now made in a similar manner, to which varying quantities of salicylic acid and carbolic acid were added, with the following results:—

To 13 grams of flour, 10 grams of water and 1 gram of yeast were added :—	Gram.	Results.
Salicylic Acid . . .	0·113	Did not swell at all, even after standing for some time at an elevated temperature.
" " " " " "	0·056	Did not swell.
" " " " " "	0·028	Swelled after 14 hours.
" " " " " "	0·014	Swelled after 1 hour.
Carbolic Acid . . .	0·2	Did not swell.
" " " " " "	0·15	Swelled after 12 hours..
" " " " " "	0·1	Swelled after 1 hour.
" " " " " "	0·05	Swelled after 5 minutes.

From these experiments the author deduces that one gram of salicylic acid is capable of hindering the fermentative action of—

18 grams of yeast	Entirely.
36 " " " " " "	Fourteen hours.
72 " " " " " "	One hour.

On the other hand, that one gram of carbolic acid is capable of hindering the fermentative action of—

5 grams of yeast	Entirely.
7 " " " " " "	Twelve hours.
10 " " " " " "	One hour.

From this it would appear that salicylic acid is more than three times as powerful in its antifermentative action as carbolic acid.

The Antiseptic Action of Salicylic Acid. Prof. Salkowsky. (*Pharmaceut. Zeitung*, xx., 418, from *Berl. klin. Wochenschr.*) The results of the author's experiments on the antiseptic action of salicylic acid are less favourable than those previously published, as will be seen from the following summary.

A strong aqueous solution of salicylic acid retards putrefaction, but does not entirely prevent it. It does not possess deodorizing properties as some have maintained, for the odour of putrid liquids remains unchanged after the addition of the acid. Salicylic acid does not produce its antiseptic effect by splitting up into carbonic and carbolic acids, as originally supposed by Kolbe, for its action is stronger than that of carbolic acid. From putrid mixtures containing salicylic acid, the latter can be regained by extraction with ether, but the tests for carbolic acid give a negative result.

Benzoic acid appears to possess stronger antiseptic properties than salicylic acid. Fresh meat, either chopped or cut into pieces, when placed in an aqueous solution of benzoic acid shows no signs of putrefaction even after three months; the liquid remains perfectly

clear, and retains the odour of benzoic acid. The acid prepared from urine is as active in this respect as that obtained from benzoin.

For external applications also benzoic acid appears to be preferable to salicylic acid, as it is cheaper and prevents putrefaction more effectually. Further clinical experience, however, is requisite for a correct appreciation of the comparative merits of carbolic, benzoic, and salicylic acid.

For internal administration as antiseptics, the two last named acids are equally unsuited, as they enter into combination with the soda of the blood. In this respect phenol, thymol, and similar substances, which pass through the organism without undergoing any change, deserve the preference.

NOTES AND FORMULÆ.

PART IV.

NOTES AND FORMULÆ.

Elixir of Tar. M. Magnes-Lahens. (*Journ. de Pharm. et de Chim.*, 4th series, xx., 126.) After giving a short account of the various methods adopted in France for the preparation of tar water of different degrees of strength, the author recommends the substitution for all of them of an *elixir* of tar, made as follows :—

Alcohol at 67° C.	100 grams.
Tar	5 "
Sugar	15 "

The sugar and the tar are crushed in a mortar, with gradual addition of alcohol until all the sugar has been dissolved. The solution is then filtered.

M. Magnes-Lahens has found that 100 grams of the elixir contain 3 grams of hydro-alcoholic extract of tar, so that 5 grams (or a teaspoonful) contain 0.15 gram. This dose is sufficient for a glass of water. The quantity can of course be augmented or lessened according to requirement. The tar water thus obtained contains alcohol, but in such small proportion that it is hardly perceptible to the taste.

It can be kept without change for a long time, and is very easily prepared.

Impermeable Paper. (*Journ. Frank. Inst.*, Aug., 1874.) By plunging a sheet of paper into an ammoniacal solution of copper for an instant, then passing it between the cylinders and drying it, it is rendered entirely impermeable to water, and may even be boiled without disintegrating. Two, three, or any number of sheets thus rolled together become permanently adherent, and form a material having the strength of wood. By the interposition of cloth or of any kind of fibre between the layers, the strength is vastly increased.

Iodized Glycerin. (*Amer. Druggists' Circular.*)

R Iodide of Potassium	1 oz.
Resublimed Iodine	1 oz.
Glycerin, to make	16 fluid oz.

Powder the iodide, and dissolve in about four ounces of the glycerin; add the iodine, and rub well in a mortar until it is dissolved. Lastly, add the remainder of the glycerin.

This preparation is said to be as efficacious as the tincture, and to have the advantage of not staining the skin.

Pills of Iodised Albumen. M. Collas. (*Chem. and Drug.*, 1875, p. 79; from *Journ. de Pharm. et de Chim.*, Feb., 1875, p. 86.) The author has successfully employed albumen as a vehicle for the administration of iodine. By this means the irritant action of the iodine is avoided, and a definite amount readily administered. It is prepared by briskly agitating a solution of albumen with iodine, either in very fine powder, or dissolved in some appropriate liquid. The mixture, at first of a deep brown colour, becomes colourless after some hours' contact, and does not give a violet colour with starch. The product is then dried with a gentle heat on a stove, and immediately made into pills. Each pill should contain five milligrams of iodine. According to Dolbeau, iodine thus prepared is innocuous and free from the many inconveniences usually consequent on its administration. Five or six pills may be taken daily in cases of glandular swellings and chronic ostitis.

Syrups of Hypophosphites. Dr. C. G. Polk. (*Tennessee Pharmacal Gazette*, Nov., 1874.)

Syrup of Ferric Hypophosphite.

This preparation is obtained by decomposing sodic or calcic hypophosphite with ferric sulphate. The following formula is recommended:—

R	Sodic Hypophosphite	256 grs.
	Sol. Ferric Sulph.	q. s.
	Sol. Acid Hypophosph.	1 oz.,
	or sufficient to dissolve the precipitate.	
	Syrup. q. s. ad	12 oz.

Decompose the sodic hypophosphite with sufficient of the iron solution, wash the ferric hypophosphite, dissolve it in the acid, and add the syrup.

Syrup of Ferrous Hypophosphite.

1. R	Ferrous Sulphate	15 drs.
	Potassic Hypophosphite	1 oz.
	Hypophosphorous Acid	14 oz.
	Sugar	14 oz.
	Water, sufficient.	

Dissolve the iron in five ounces of boiling water, and the potassic

hypophosphite in ten ounces of boiling water, mix the solutions; let it stand in a closely covered vessel two hours, filter on the sugar, and add the hypophosphorous acid solution.

2. R. Fresh Ferrous Oxide	q. s.
Hypophosphorous Acid	5 oz.
Sugar	8 oz.

Saturate three ounces of the acid with the ferrous oxide, add the remainder of the acid and the sugar, and dissolve without heat. Each dram will contain about six grains of ferrous hypophosphite almost entirely free from any impurities.

The author prefers the second formula, for which he is indebted to Mr. Creuse, of New York.

Syrup of Hypophosphite of Iron and Manganese.

R. Ferrous Oxide	256 grs.
Manganese Hypophosphite	256 grs.
Hypophosphorous Acid	10 oz.
Sugar	10 oz.

Dissolve the iron and manganese in the acid, add the sugar, and dissolve. To this add hypophosphite of ammonium, when disease does not contra-indicate, in the proportion of three grains to each dram. It preserves the syrup, and also enhances, in a very positive manner, its therapeutical properties. If it be desirable, one grain of quinia and one fortieth of a grain of strychnia may be given with each dose.

Thus administered in conjunction with cod-liver oil, it possesses in a marked degree, the power of arresting the progress of phthisis.

Syrup of Hypophosphite of Calcium and Manganese.

R. Calcii Hypophosph. recent	256 grs.
Manganesii Hypophosph. recent	64 grs.
Acidi Hypophosph. sol.	2 drs.
Syrupi q. s. ad	16 oz. M.

This preparation given in doses of a teaspoonful three times a day, is valuable in the wasting diseases of children, in which there seems to be a deficiency of lime in the system, with general impairment of the nutritive functions. The author likes to combine it with an aromatic elixir of calisaya bark.

Syrup of Hypophosphite of Iron. P. Carles. (*Bull. Soc. de Pharm. de Bordeaux*, xiv., 102; *Pharm. Journ.*, 3rd series, v., 25.) Syrup of hypophosphite of iron having for some time past been

frequently prescribed by the physicians of Bordeaux, the author took occasion to criticize, at a recent meeting of the Society of Pharmacy in that city, the previously existing formulæ for its preparation. He alluded principally to two formulæ, as being the more generally known: those of Wood and Hardy.

According to Wood's formula, the hypophosphite of lime is reduced to a fine powder, and upon this is poured a solution of sulphate of iron acidulated with phosphoric acid; sulphate of lime is formed, which is precipitated, whilst the acid hypophosphite of iron remains in solution, and is afterwards mixed with simple syrup.

Mr. Carles says of this formula, that it is defective, in that (1) it gives an acid solution, in consequence of the addition of the phosphoric acid, which changes the nature of the desired product; (2) that it furnishes a syrup which is too dilute and difficult to preserve; (3) that the proportions of the ingredients do not correspond with the equivalents,—85 for the hypophosphite and 139 for the ferrous sulphate,—required for double decomposition to take place exactly.

Hardy's formula consists in preparing hypophosphorous acid by the aid of hypophosphite of baryta and q. s. sulphuric acid, removing sulphate of baryta by filtration, and producing the hypophosphite of iron by boiling metallic iron in the dilute acid. This formula is criticized by the author on the ground that hypophosphite of baryta is a salt rarely met with in pharmacy, and, what is of more importance, is a poisonous salt; so that if the operation be conducted by a person only little accustomed to chemical reactions, a portion, in consequence of its solubility, may remain undecomposed in the liquor, and give rise eventually to a poisonous medicament. Besides, the process is tedious and minute, and requires special apparatus.

Another method which has been suggested, is to prepare the solution of hypophosphite of iron intended for the syrup, by double decomposition between oxalate of iron, which is now to be met with in most French pharmacies, and hypophosphite of lime. M. Carles finds, however, that in practice this method is very defective.

Commercial neutral oxalate of iron requires for its solution a large quantity of liquid, and the same inconvenience, though in less degree, occurs with hypophosphite of lime; so that the precipitation of the oxalate of lime is very slow, and the solutions are too dilute to be converted into syrup.

From a consideration of these facts, the author sought for a

simple and rapid method, but one where the quality of the product would not be sacrificed to celerity. At first he thought to prepare the hypophosphite of iron by means of ferrous sulphate and hypophosphite of soda. The great solubility of these salts allowed of their being brought into contact in a very small volume of liquid. The addition of alcohol to the mixture separates the sulphate of soda, so that after filtration and evaporation of the alcohol, there remains a solution of hypophosphite of iron, which only requires to be mixed with very concentrated sugar syrup, or to be itself converted into syrup by the addition of suitable quantities of boiled water and sugar. Unfortunately alcohol only slowly and incompletely determines the precipitation of the sulphate of soda, and the filtration too is slow, so that in the interval the hypophosphite becomes partially insoluble and peroxidized.

M. Carles has finally adopted the following process as the best:—

Ferrous Sulphate (crystals)	15·00
Hypophosphite of Soda (crystals)	9·14
Distilled Water (boiled)	350·00
Powdered Sugar.	660·00

The ferrous sulphate is pulverized, and dissolved separately in about 20 grams of the water, and the hypophosphite in the remainder. The two solutions are mixed, and agitated violently. After a quarter of an hour the magma is thrown upon a fine cloth, pressed, and if necessary filtered through paper of open texture. A sufficiency of boiled distilled water is then added to make up the quantity of 360 grams of liquid, in which the sugar is dissolved by the aid of a gentle heat. The keeping of the syrup in partially filled bottles should be avoided as much as possible.

Each spoonful (25 grams) of the above syrup will contain 0·25 gram of hypophosphite. By mixing the syrup with an equal quantity of syrup of orange flowers, a medicine of much more agreeable flavour will be obtained. In this case each spoonful will contain 0·125 gram of hypophosphite of iron.

On the Power of Salicylic Acid to Arrest Fermentation. C. Neubauer. (*Journ. Pract. Chem.*, 2nd series, xi., 1-9.) Four series of experiments are minutely described, which were made to ascertain the arrestive properties of salicylic acid as regards the fermentation of wine-must. In all the experiments it was found when a small amount of the acid only was present, the fermentation was in a great degree diminished, and when larger quantities were used, the fermentation entirely ceased. Salicylic acid is

recommended in wine manufactories as being cleaner than the substances at present in use.

Freezing of Spirits and Wines. M. Melsens. (*Ann. Chim. Phys.*, 5th series, iii., 527-536; *Journ. Chem. Soc.*, 2nd series, xiii., 489.) A historical sketch is given of the various attempts made to freeze alcoholic liquids. The author, by the description of his experiments, wishes to create a taste for frozen wines and liqueurs. Brandy may be rendered viscous at -30° , and is said to possess an exquisite flavour. It must, however, be drunk out of wooden cups, to prevent the lips being "burnt." The sensation of cold is not experienced till the temperature has reached -60° . The lowest temperature to which the author has subjected a liqueur was -71° . The effect on the mouth was as if it had been a little too hot. The freezing mixture was ether and solid carbonic anhydride.

Bromide of Iron and its Preparations. M. Prince. (*Bull. Soc. Pharm. Bord.*, xi., 138; *Pharm. Journ.*, 3rd series, v., 67.) According to a calculation based upon the chemical equivalent of bromine compared with that of iodine in combination with iron, the author was induced to try the following formula:—

R	Unoxidized Iron Filings.	100
	Distilled Water	768
	Bromine	210

After having introduced the iron filings and the water into a vessel having a capacity of about two litres, 40 or 50 grams of bromine were added, and the mouth of the vessel promptly stopped with a good cork, in order to avoid loss of the latter, which escaped quickly in reddish yellow vapours due to the development of heat when the first portions came into contact. These vapours disappeared, and were replaced by others of a violet colour, which, like the former, only lasted a few seconds. A fresh portion of bromine was then added, and this operation was repeated until all the bromine had been used.

When this was effected the whole (including the excess of iron contained in the solution, which is indispensable to its preservation) was transferred to a stoppered bottle.

The first operation being completed, the author sought to ascertain whether the solution so obtained contained the estimated quantity of protobromide of iron. Thirty grams were filtered and rapidly evaporated to dryness, when it yielded one third of its weight of the anhydrous salt. The author, therefore, gave it the name of normal titrated solution of protobromide of iron, and has used it

in three different preparations, of which the following are the formulæ:—

Bromide of Iron Lozenges.

R	Normal Solution (filtered)	. . .	18.00 grams.
	Powdered Gum Tragacanth	. . .	1.50 „
	Finely powdered Sugar	. . .	100.50 „

Evaporate the solution in a porcelain capsule to half its weight (nine grams); pour it then into a marble mortar, add the gum, previously mixed with a small quantity of the sugar, and bray the paste well. Afterwards spread it out upon a marble slab, and divide it into lozenges weighing one gram each, which should be dried promptly, and put in a dry place. Each lozenge will contain five centigrams of protobromide of iron.

Bromide of Iron Pills.

R	Normal Solution (filtered)	. . .	12 grams.
	Iron Filings	. . .	0.10 „
	Powdered Gum Arabic	. . .	q. s.
	Liquorice in Powder	. . .	q. s.

To make eighty pills.

Pour the solution with the small quantity of iron into a porcelain capsule, and evaporate quickly until the liquid has lost two thirds of its original weight; then pour it, still warm, into a well dried and slightly warmed porcelain mortar. Add at the same time the two powders previously mixed and in sufficient quantity to form a consistent pill mass, which should be divided equally into eighty pills, and kept in a well-stoppered bottle protected from damp. Each pill will contain five centigrams of the protosalt.

Syrup of Bromide of Iron.

R	Normal Solution (filtered)	. . .	12 grams.
	Syrup of Gum and Orange Flowers	. . .	620 „

This quantity will represent a demi-litre of syrup containing four grams of protobromide of iron, or 20 centigrams of the active principle to each 31.60 grams of the syrup.

Syrup of Bromide of Iron. M. H. Steles. (*Pharm. Journ.*, 3rd series, v., 163.) The author thinks that the syrup of bromide of iron made according to the formula given by M. Prince in the *Bull. Soc. Pharm. Bord.*, is much weaker than the preparation usually recommended in this country, and suggests the following process:—

℞ Thin Iron Wire, free from rust	$\frac{1}{2}$ oz.
Bromine	320 grs.
Distilled Water	1 oz.

Put the wire and water in an eight-ounce flask, the lower portion of which is placed in a vessel of cold water, add the bromine gradually, corking the flask after each addition, and taking care that one portion is nearly neutralized before another is poured in. When all the bromine has been added, heat the flask gently until the brown colour disappears, and filter the solution, whilst hot, through paper; wash the wire with a little distilled water, filter the washings, add them to the filtrate, and make the resulting liquid measure fl. 3 ij. mix this with fl. 3 xvj. of syrup. One fluid dram contains three grains of Fe Br₂.

If the flask be not kept cool, and the process controlled in the manner directed, the action becomes so violent that a considerable portion of the bromine is lost.

Bromide of iron is also given in combination with bromide of quinine or bromide of strychnia, or with both, the amount of these in fl. 3 j. of the syrup being one grain and $\frac{1}{32}$ grain respectively.

Unofficial Formulæ. Reported at the meeting of the American Pharmaceutical Association, at Louisville, by Dr. J. F. Hancock. (*Pharmaceutical Gazette*, Jan. 6, 1875.)

Chlorate Mixture.

℞ Chlorate of Potash	1 dr.
Bicarbonate of Soda	2 drs.
Mix.	

Chloroform and Aconite Liniment.

℞ Chloroform	2 fl. ozs.
Tincture of Aconite Root	2 "
Soap Liniment	12 "
Mix.	

Stokes's Liniment.

℞ Oil of Turpentine	3 fl. ozs.
Strong Acetic Acid	4 fl. drs.
Yolk of one Egg.	
Rose Water	3 fl. ozs.
Oil of Lemon	1 fl. dr.
Mix.	

Balsamic Diachylon Ointment.

℞ Pure Olive Oil	15 fl. ozs.
Oxide of Lead	3 ozs. 6 drs.
Distilled Water	2 pts.
Oil of Lavender	2 fl. drs.
Peruvian Balsam	1 fl. oz.

To the olive oil add half a pint of the water, and mix thoroughly; then sprinkle in the oxide of lead, and again stir well. Place the vessel containing the mixture in a water bath, or over a slow fire, and stir briskly until the combination is thorough. When the ointment is cold, add the oil of lavender and peruvian balsam, and mix intimately; lastly, add the remaining water.

Benzoated Oxide of Zinc Ointment.

R	Lard and Olive Oil, each	5	ozs.
	White Wax	2½	„
	Spermaceti	2½	„
	Oxide of Zinc	2½	„
	Pulv. Gum Benzoin	½	„
	Mix.		

Ointment of Red Oxide of Mercury with Castor Oil substituted for Lard.

R	Red Oxide of Mercury	1	dr.
	White Wax	2	drs.
	Castor Oil	6	„

Melt together the white wax and castor oil, pour the mixture into a warm mortar, and incorporate with it the red oxide of mercury.

Compound Powder of Phosphates.

R	Phosphate of Soda	½	oz.
	Phosphate of Lime	½	„
	Phosphate of Iron	½	„
	Sugar, in fine powder	1	„

Expose the phosphate of soda to heat in a porcelain dish until the water of crystallization is dissipated, taking care not to continue the heat until it is caustic to the tongue. Having the other powders perfectly dry, mix the whole thoroughly.

Dose: From ten to twenty grains three or four times daily.

Species St. Germain.

R	Senna Leaves	4	ozs.
	Elder Flowers	2½	„
	Fennel Seed	10	drs.
	Anise Seed	10	„
	Cream of Tartar	6	„

Digest the senna in strong alcohol, dry and mix intimately, and put up in doses of five drams each.

Directions: Infuse the contents of one package in a half a pint of boiling water; strain, and take at one dose for an adult.

Compound Syrup of Hypophosphites.

R Hypophos. Lime	256 grs.
Hypophos. Soda	192 "
Hypophos. Potash	128 "
Protosul. Iron	185 "
Hypophos. Acid, specific gravity 1.036	9 fl. drs.
Sugar	12 ozs.
Water	q. s.

Dissolve 96 grains of the hypophosphite of lime in four fluid ounces of water, with the aid of heat, and acidulate the solution with a small portion of the hypophosphorous acid. Dissolve the protosulphate of iron in two fluid ounces of water; mix the two solutions, and allow the mixture to stand until the sulphate of lime, which is precipitated, has subsided, and pour the whole on a paper filter. After the clear solution has passed through the filter, wash the adhering hypophosphite of iron from the sulphate of lime with a small quantity of water, acidulated as before, and preserve the solution. Dissolve the remainder of the hypophosphite of lime with the hypophosphites of soda and potash in four fluid ounces of water, with the aid of heat, adding the remainder of the hypophosphorous acid. Mix the solutions, adding water sufficient to make the whole measure ten fluid ounces, which pour into a bottle containing the sugar, and agitate the mixture occasionally until the solution is complete.

Compound Aromatic Syrup of Senna.

R Alexandria Senna	4 ozs.
Jalap	1½ "
Rhubarb	½ "
Cinnamon	1 dr.
Clove	1 "
Nutmeg	½ dr.
Oil of Lemon	20 minims.
Sugar	24 ozs.
Diluted Alcohol	q. s.

Reduce the root leaves and spices to a moderately fine powder, and treat with the diluted alcohol, by percolation, to exhaustion; when about one quart has passed, evaporate by means of a water bath to eighteen fluid ounces, and filter, if necessary; then add the sugar, and dissolve by water bath; when cold, add the oil of lemon. It should measure thirty-two fluid ounces.

Compound Syrup of Phosphates.

℞	Protosul. of Iron	10 drs.
	Phosphate of Soda	12 „
	Phosphate of Lime	6 „
	Glacial Phos. Acid	13 „
	Carbonate of Potash	1 „
	Carbonate of Soda	40 grs.
	Muriatic Acid	q. s.
	Water of Ammonia	q. s.
	Sugar	35 ozs.
	Cochineal, in fine powder	1 dr.
	Tincture of Orange Peel	4 fl. drs.

Dissolve the protosulphate of iron in two fluid ounces of boiling water, and the phosphate of soda in one fluid ounce of boiling water, mix the solutions, wash the precipitate, and drain it on a muslin filter.

Mix the phosphate of lime with four fluid ounces of boiling water, and add a sufficient quantity of muriatic acid to dissolve it; then add a sufficient quantity of water of ammonia to reprecipitate the phosphate of lime; wash the precipitate, and drain it on the same filter with the phosphate of iron.

Dissolve the glacial phosphoric acid in about two fluid ounces of water, with the aid of heat; add the moist precipitates, and when they are perfectly dissolved add the carbonates of potash and soda. Transfer the whole to a jar or bottle, and allow the precipitate which is formed to subside. Draw off the clear solution with a siphon, and preserve it in a separate vessel. To the remainder, containing the precipitate, add a sufficient quantity of muriatic acid to dissolve it, and add it to the other portion of the solution, with a sufficient quantity of water to make the whole measure twenty-four fluid ounces; then add the sugar, cochineal, and tincture of orange peel, and agitate occasionally until the sugar is dissolved. Lastly, strain or filter.

Compound Tincture of Opium.

℞	Tincture of Opium	1 fl. oz.
	Tincture of Capsicum	1 „
	Spirit of Camphor	1 „
	Purified Chloroform	3 fl. drs.
	Alcohol	q. s. for 5 fl. ozs.

Each fluid dram contains about 100 drops, consisting of twelve drops each of the first three ingredients, and four and a half minims or eighteen drops of chloroform.

Dose: One teaspoonful in water for adults.

Emulsio Carnis. J. Kemble. (*Amer. Journ. of Pharm.*, 4th series, iv., 464.) An article in the *Medical Times* on the administration of raw beef induced the author to institute a series of experiments to determine the possibilities of preparing a solution which would keep long enough without change to be of practical use. After quoting the results of his experiments, he recommends the following formula as yielding a pleasant palatable mixture which would keep for four days during hot weather and for a week in winter.

R Fresh Raw Beef (lean)	3vj.
Sweet Almonds, deprived of their shells and roasted	3j.
Bitter Almonds	3vj.
Sugar	3vj.
Glycerin	3ij.
Water sufficient for emulsion	Oj.

Rub or beat the beef, almonds, and sugar, to a fine pulp in a wedgwood or wooden mortar, then add water gradually until a smooth emulsion is formed, and strain through a sieve or coarse cloth; return the residuary mass to the mortar, manipulate with the balance of the water, until fl. 3xiv. are obtained, strain all through a finer strainer, add the glycerin, and bottle; the bottle is to be kept well corked.

Dose: 3j., containing 3ij. of the beef.

The physician, in prescribing, can order the addition of brandy, pepsine, or any other medicine he wishes to administer at the same time.

Comparative Method of Determining Tanning Materials. E. Schmidt. (*Chem. News*, from *Bull. de la Soc. Chim. de Paris*.) The question to be solved is—Knowing that a certain weight (p) of pure tannin is required to obtain a certain result, how much of another tanning body, *e.g.*, the extract of a wood, is required to produce the same result? None of the published methods for the determination of tannin is sufficiently precise, easy, and rapid for industrial purposes. The author proposes a modification of Pribram's method with sugar of lead.

A. Preparation of the Test-Liquor.—50 grams neutral acetate of lead are dissolved in 400 grams of alcohol at 92 per cent., and distilled water is added to make up 1 litre.

On the other hand, 1 gram of tannin is dissolved in 40 grams of alcohol at the same strength, and the solution is made up with water to the bulk of 100 c.c. This being done, 10 c.c. of the tannin

solution are mixed with 20 c.c. of water, and heated to 60°. The lead liquor is then run into the hot solution from a burette graduated to tenths of a c.c., so long as a precipitate is formed. At this temperature, and with these alcoholised liquids, the precipitate forms and settles rapidly. Iodide of potassium may be used as an indicator to show excess of lead, proceeding in the same manner as is done with ferrocyanide in titrating phosphates with nitrate of uranium. If we suppose that to precipitate 10 c.c. of the tannin solution 28 degrees of the lead liquor have been required, then 2.8 c.c. of the latter = 0.10 gram of tannin.

B. Preparation of the Sample to be Tested.—Suppose that chestnut-bark is to be examined. It is coarsely powdered, and 10 grams are mixed with an equal volume of washed sand, and exhausted with water at 50° or 60° C. The filtered liquid is evaporated to dryness in the water bath in a tared porcelain capsule. After evaporation the capsule is weighed, which shows the yield of the bark in aqueous extract. This is taken up in 40 grams of alcohol at 92°, and water is added to make up 100 c.c. The liquid is filtered if needful. In this manner the resinous, albumenoid, pectic, and gummy matters are got rid off.

C. Titration.—The liquid thus prepared is divided into two parts. The first, one third of the entire volume, serves for direct determination of the acetate of lead. Suppose that a gram of the dry extract of chestnut has required—for 10 c.c. of the tannin liquor—in three successive experiments, 16, 17, and 16 degrees of the burette, which corresponds to 57 per cent. of tannin. But this figure 57 represents, not only tannin, but every other substance capable of precipitating acetate of lead.

The tannin is then absorbed with bone-black, previously washed with hydrochloric acid, and dried at 100° C. in the following manner:—We act with bone-black upon the tanning liquor, and on a solution of pure tannin prepared at a standard somewhat lower than that indicated for the extract by the first direct titration. In the present case this solution of tannin should be prepared at 55 per cent.

From one and the same glass tube, about 1 centimetre in diameter, we cut off two lengths of 20 centimetres each, and we draw out each at one of its ends. The two tubes are fixed perpendicularly, with the point downwards, and plugged with a little carded cotton. Into each is put 10 grams of the bone-black, pouring into one of them the second part of the tanning liquor under examination, and into the other the same volume of the pure solution of pure tannin at 55 per cent.

20 c.c. of the tanning liquor (which will be found to have retained its original brown colour in spite of the bone-black) are now heated to 60°C ., and the standard lead liquor is added from the burette as before. Two successive trials show 16 degrees, = 8 degrees for 10 c.c., in place of the 16 degrees found for 10 c.c. on direct titration. On the other hand, 20 c.c. of the solution of pure tannin require 14 degrees, or 7 for ten c.c. Thus we see that in the tanning liquor (chestnut extract) there is a certain quantity of matter which acts upon the standard lead solution like tannin, corresponding to 1 degree of the lead liquor, *i.e.*, to 357 thousandths of a centigram of tannin; 28 degrees therefore correspond to 10 centigrams. The figure 57 obtained by direct titration is, therefore, too high by 3.57 per cent., and the extract contains $57 - 3.57 = 53.43$ per cent. of tannin.

New Method of preparing Highly Concentrated Formic Acid by means of Dehydrated Oxalic Acid and a Polyatomic Alcohol. M. Lorin. (*Comptes Rendus*, May 31, 1875.) Into a rather large tubulated retort is introduced white glycerin, which is concentrated by heat before the addition of the dehydrated oxalic acid in powder. The retort is heated in the water bath. Decomposition takes place at about 80° , but it is much accelerated by a slight rise of temperature, and at 87° the liquid is covered with a layer of bubbles half a centimetre in thickness. When the decomposition slackens more oxalic acid is added. The formic acid is absolutely free from allyl compounds, and contains 94 per cent. of actual acid.

Barytes Green, or Manganate of Baryta. E. Fleischer. (*Moniteur Scientifique*, October, 1874; *Chem. News*, xxx., 228.) This salt has been introduced into commerce under the names of Cassel green or Rosenstiehl's green. It has generally been prepared by calcining nitrate of baryta with oxide or peroxide of manganese, or by fusing caustic baryta with manganese and chlorate of potash. The author gives a new method for its preparation. On precipitating a green boiling solution of manganate of potash with chloride of barium, there is formed a deposit, strongly granular, but not crystalline. This precipitate is of a violet colour, bordering on blue. It is well washed by decantation, and then filtered. When dried its colour becomes paler as the temperature rises. At a dark red heat it is white, with a slight greyish blue tinge. If heated higher, with access of air, it becomes by degrees completely green, then of a fine blue, and at very elevated temperatures it is converted into a dirty brown grey. If a solution of permanganate of potash is precipitated with

chloride of barium, and allowed to boil, there is slowly formed a reddish violet deposit (colour of peach blossom), and the liquid retains an intense violet colour. The precipitate may be washed by decantation, and filtered without decomposition. It can even be dried at 100° without losing its colour. When gradually heated the permanganate of baryta loses its colour like the manganate, but at very high temperatures it behaves differently. When its colour has once been destroyed by a moderate heat, it does not become either green or blue by further heating with access of air. The whole becomes at once of a greyish brown. The finest barytes green is formed by calcining the manganate of baryta. Rosenstiehl's process,—the fusion of hydrate of baryta with chlorate of potash and peroxide of manganese,—yields an inferior colour.

Liquor Ferri Phosphatis cum Quinia et Strychnia. C. R. Blackett. (*Pharm. Journ.*, 3rd series, v., 2.) In a previous note on *Syrupus Ferri Phosphatis* (*Pharm. Journ.*, 3rd series, iv., 890), the writer recommended the keeping of a solution of ferrous phosphate with the alkaloid in it for the preparation of a syrup of phosphate of iron, quinine, and strychnine, as it may be required. He now writes respecting this suggestion, that he has found this method does not apply to the phosphate of iron, quinine, and strychnine liquor. The strychnine does not exert any decomposing action, but the quinine does most rapidly cause a decided change in the colour. He finds that it is very easy to keep a solution of phosphate of iron and strychnia ready, and then add one grain of phosphate of quinine for each dram of syrup required.

Preservation of Essence of Citron. (*The Pharmacist*, vi., 322.) The addition of two ounces of water to each pound of essence of citron assures its preservation, and the agreeable odour is retained for many years; the water in falling to the bottom carries down impurities which favour the resinification of the essence.

Purification of Carbon Disulphide. (*Chem. and Drug.*, 1874, 231.) A great obstacle to the use of this important body is the detestable odour which almost all samples give out, and which is especially objectionable when about to be used in medicine as an anæsthetic.

M. Yvon, of Alfort, proposes a process which is at the same time rapid, economical, and effective. It consists in the addition of copper turnings to the disulphide. It is not necessary to agitate.

The disulphide soon loses most of its colour, and has then an ethereal odour free from the usual unpleasantness. Millon has employed reduced copper for the same purpose.

Ratafia. (From the *Chemist and Druggist*, 1875, p. 225.) The name ratafia is given to those preparations which may be designated as medicated, but which nevertheless are employed more as table liqueurs than as remedies, though they in general possess highly stomatic characteristics.

These liqueurs are prepared in various manners, but generally the aromatic ingredients are macerated in the alcohol, then filtered, and sugared to the proper consistency. Another step in their perfection is made by distillation and further sugaring of the residue: this product is called the cream by distillers. With this may be mixed the syrups of various fruits, thus obtaining the desired flavours. Such preparations are, strictly speaking, ratafias. They may be left their natural colour but are more frequently artificially tinted in different shades suggested by the fruits from which they are derived. As regards this last process, it will hardly be a mystery to any pharmacist. It is very essential that the alcohol employed shall be as inodorous as possible. The following formulæ are given:—

Vanilla.

R	Vanilla Beans	4 grams.
	Alcohol, 82 per cent.	5,000 "
	Filter, and add sugar	1,000 "

Orange Flower.

Distil a mixture of—

Alcohol, 88 per cent.	4,000 grams.
Oil of Lemon	8 "
Oil of Bergamotte	8 "

To 4,000 grams of the product add—

Orange-flower Water	4,000 "
Water	7,000 "
Sugar	2,000 "

and filter.

Curaçoa.

Macerate for 8 days—

Bitter Orange Peel	500 grams.
Cloves	8 "
Cinnamon	8 "
Alcohol	7,500 "

Filter and add—

Sugar	2,500 "
Water	1,000 "

Anise.

Macerate together—

Anise Seed	45 grams.
Alcohol	1,500 "
Water	1,000 "
Sugar	125 "

After 8 days, filter, and add—

Sugar	500 "
Water	500 "

Quince.

Macerate together, 15 days—

Syrup of Quinces	3,000 grams.
Alcohol	1,500 "
Sugar	1,250 "
Bitter Almonds, peeled	15 "
Cinnamon	12 "
Coriander	8 "
Mace	4 "
Cloves	3 "

Filter.

Ratafia Liqueur Raspail.

Macerate, during 15 days, as follow:—

Angelica Root	15 grams.
Angelica Seed	15 "
Calamus Aromatic	4 "
Mace	2 "
Myrrh	2 "
Cinnamon	2 "
Cloves	1½ "
Aloes	1½ "
Vanilla	1½ "
Saffron	1½ "
Alcohol	8,000 "
Add Sugar	500 "
and filter.	

Maraschino.

R Kirsch-wasser	300 grams.
Water	2,400 "
Spirit of Raspberries	200 "
Sugar	600 "
Alcohol, 90 per cent.	800 "

Hydrate of Chloral as a Solvent: Suggestions concerning its Employment. R. F. Fairthorne. (*Amer. Journ. Pharm.*, 4th series, iv., 549.) Thinking that the power of hydrate of chloral as a solvent might open the way to a more extensive application, the author

wishes to draw attention to its value when thus employed in connection with the alkaloids and a few other substances.

A solution consisting of nine parts of hydrate of chloral and three parts of water is capable of dissolving the following substances to the extent named.

One grain of morphia is dissolved by a portion of the liquid containing twelve grains of the hydrate, one grain of veratria by a portion containing five grains, and one grain of atropia by a quantity containing twenty grains.

These active principles should be in powder, mixed with the solvent in test tubes, and heated by means of a water bath, with occasional agitation.

The solutions thus made are in a convenient form for employment either alone or when mixed with oils, ointment, or with glycerin. Camphor, too, is freely dissolved by them, and in some cases can be added to them with advantage.

Glycerin is a convenient agent for forming solutions with hydrate of chloral and the above-named substances, and the following will be found, when properly combined, to produce permanent and elegant preparations, viz. :—

Chloral Glycerite of Morphia.

R	Morphia (powder)	. . . . .	5 grs.	
	Chloral Hydrate	. . . . .	1 dram.	
	Glycerin	$\frac{1}{2}$ a fl. oz.	M. s. a.

Chloral Glycerite of Veratria.

R	Veratria	. . . . .	5 grs.	
	Chloral Hydrate	. . . . .	1 dram.	
	Glycerin	$\frac{1}{2}$ a fl. oz.	M. s. a.

Ointment of Chloral and Veratria.

(Corresponding in strength to the Ung. Veratriæ, U.S.P.)

R	Veratria	. . . . .	10 grs.	
	Chloral Hydrate	. . . . .	1 dram.	
	Water	. . . . .	6 drops.	
	Lard Ointment	. . . . .	$\frac{1}{2}$ oz.	M. s. a.

Chloral Glycerite of Morphia and Camphor.

R	Morphia	. . . . .	5 grs.	
	Hydrate of Chloral,	. . . . .	
	Camphor	. . . . .	each 1 dram.	
	Glycerin	. . . . .	$\frac{1}{2}$ a fl. oz.	M.

Lotion of Chloral and Iodine.

R	Iodine	20 grs.
	Iodide of Potassium	6 grs.
	Glycerin	1 fl. oz.
	Chloral Hydrate	2 drs. M. s. a.

Hydrate of chloral can also be combined with collodion, in which it dissolves after the addition of a few drops of alcohol.

Fluid Extract and Syrup of Azedarach. John J. Miles. (Abstract of an inaugural essay, *Amer. Pharm. Journ.*, 4th series, iv., 359.) *Melia Azedarach*, an elegant tree, twenty-five to thirty-five feet in height, is the principal shade-tree in the avenues of many of the Southern villages and cities of the United States, where it is known under the names of bead tree, pride of China, China tree, pride of India, etc. It is avoided by flies and other insects. The bark of the root is officinal in the U.S. Pharmacopœia, but all parts of the tree possess medicinal properties; it acts as an anthelmintic, and in large doses narcotic.

The fluid extract is prepared as follows: Take of the inner bark of the root sixteen troy ounces; dilute alcohol a sufficient quantity. Macerate the bark in sixteen fluid ounces of the dilute alcohol for twenty-four hours; then percolate until twelve fluid ounces have been obtained, and set this aside. Continue the percolation with sufficient dilute alcohol to obtain twelve fluid ounces of percolate; evaporate this to two fluid ounces, and add it to the reserved portion. Filter, add six troy ounces of white sugar, and dissolve by aid of a gentle heat.

The above extract has been used with satisfaction and good results, in the dose of one-half to one teaspoonful, according to age.

A very agreeable syrup may be prepared from the extract by the following formula: Take of fluid extract four fluid ounces: syrup of vanilla, eight ounces; simple syrup sufficient to make one pint. This is used in the dose of three to four teaspoonfuls. The syrup of vanilla wholly disguises that bitter and disagreeable taste that is so objectionable in most of the anthelmintics.

Emulsion of Cod-Liver Oil and Hypophosphites. (*Canadian Pharmaceutical Journal.*)

Powdered Gum Tragacanth	½ oz.
Glycerin	3 "
Water	9 "

Rub the tragacanth with the glycerin, and add the water gradually. To this mucilage add the following solution:—

Hypophosphite of Lime	4½ drs.
Hypophosphite of Soda	2½ "
Hypophosphite of Potash	2½ "
Sugar	4 lb.
Boiling Water	12 oz.

Make the admixture gradually, with brisk trituration. To this medicated mucilage add the following, as a flavour and preservative:—

Otto Almonds, bitter	10 drops.
„ Cinnamon	5 "
„ Canella	5 "
Alcohol	6 oz.

The whole will now form a semi-transparent mucilaginous liquid of about thirty-seven fluid ounces in bulk. To this add gradually an equal measure of cod-liver oil, and mix thoroughly. In practice it is advisable to work on small quantities, say half-pint of each, in a number eight mortar. If care is taken the product will be very satisfactory.

Liquor Sennæ. Percy Wells. (*Pharm. Journ.*, 3rd series, v., 886.) The following formula is strongly recommended by the author as a good and efficient preparation of senna.

Mix 13 ounces water, 3 ounces rectified spirit, and 30 minims of liquor potassæ, and pour it over 6 ounces of small sifted Alexandrian senna. Keep the jar corked, and stir once or twice daily for seven days, then submit to strong pressure, and strain the liquor through fine muslin or calico. In about a week there will be a slight deposit from which, the clear liquid may be decanted and the residue can be filtered.

One part of this liquor mixed with three parts of water forms a preparation equal to *infus. sennæ*, P.L.

The Preparation of Salicylic Acid Dressings. Dr. Thiersch. (*Medical Record*, May 26th and June 2nd, 1875.) The author regards the antiseptic action of the salicylic dressing as certain as that of Lister's carbolic dressing. The salicylic acid also possesses two advantages: it is less irritating, and is not volatile. It can thus be incorporated with the dressing in greater quantity and remain for a longer time in contact with it, without endangering the result. Another advantage of salicylic acid is that it is inodorous.

For dressing with salicylic acid there should be kept at hand a supply of salicylic water—a solution of one part in 300; and of salicylic cotton, containing respectively 3 and 10 per cent. Dr. Blaser, the apothecary of the Jacob's Hospital, makes the preparations in the following way:

(a) For 3 per cent. salicylic cotton, 750 grams are dissolved in

7,500 grams of spirit of specific gravity 0.830; the solution is then diluted with 150 litres of water at a temperature from 156° to 176° F.; and the mixture is used to saturate 25 kilograms of cotton-wadding freed from fatty matter.

(b) The 10 per cent. salicylic cotton is made by dissolving one kilogram of salicylic acid in 10,000 grams of spirit of specific gravity 0.830, adding 60 litres of warm water (as above), and saturating with the mixture 10 kilograms of cotton-wool. The saturation of the cotton is best done in a large shallow wooden tub; and it is best to use only a small quantity of cotton-wool (two or three kilograms) at one time, as in only this way an equal distribution of the salicylic acid is possible. The proceeding occupies only a short time.

In charging the cotton-wool with the warm solutions of salicylic acid, it is introduced in layers, moderate pressure being applied to each layer, so that it may be completely saturated before another is introduced. After the proper quantity of cotton-wool has been introduced and is perfectly saturated, the whole is inverted, and allowed to stand for a short time (about ten minutes), so that the solution may be diffused as equally as possible. The cotton-wool is then laid in small heaps to cool, during which process the salicylic acid crystallizes; and it is then allowed to dry in a moderately warm place for about twelve hours. It is not advisable to hang it up, as, in the process of draining, the equal distribution of the acid is disturbed. The salicylic acid may not crystallize in equal amount in all parts of the wadding; and even after drying, the distribution of the acid may be rendered unequal by handling. Thus, in many parts there will be less than 3 per cent., in others more. An addition of 1 per cent. does no harm; but if in the 3 per cent. cotton-wool there be a deficiency of 1 per cent., or in the 10 per cent. cotton of 3 per cent., the deficiency should be made up from portions containing an excess.

The salicylic cotton-wool does not allow the passage of the discharges of the wound so readily as Lister's carbolic gauze; and hence, when a dry salicylic acid dressing has remained for a week or two, pus is generally found in various quantities between it and the wound. Dr. Thiersch has made some experiments in order to find a more permeable material for dressing than cotton-wool. Hemp, flax, sawdust, etc., did not answer the purpose. His attention was then called to jute; and, having obtained a supply of clean jute, he charged it with 3 per cent. of salicylic acid, adding also 20 per cent. of glycerin to prevent the acid from falling off in dust. He introduced 2,500 grams of jute into a solution of 75 grams

of salicylic acid in 500 grams of glycerin and 4,500 grams of water, at a temperature of 158° to 176° F. In this way he obtained a soft material, resembling flax, giving off but little dust, which, when left on a wound for nine days, completely absorbed thick pus, the pus becoming equally diffused through it. At the same time, the dressing remained inodorous, and gave in every part the reaction of salicylic acid on being tested with chloride of iron. On account of the equal distribution of the discharges from the wound in the jute dressing, it is not necessary to apply a strongly charged layer internally; a 4 per cent. dressing is sufficient. Dr. Thiersch believes that jute will supersede cotton as a dressing for large suppurating wounds, although it is not to be compared with the latter as regards softness. Some comparative statements of the cost are given, to show that the salicylic acid dressing, especially when jute is used, is much cheaper than the carbolic acid dressing; the proportions, calculated for a case of amputation of the thigh, being:—Lister's dressing, 2.35 *mark*; dry salicylic dressing, 1.52 *mark*; dry salicylised jute dressing, 0.92 *mark*.

The cheapest of all is the jute dressing; and it is the more so, because it can be allowed to remain a longer time on the wound without danger of an accumulation of the discharges beneath it. Dr. Thiersch's experiments with the jute dressing are as yet, however, not sufficiently numerous to enable him to speak with absolute certainty about it. He does not think that it is of much importance whether a spray of carbolic acid (1 in 50 of water) or of salicylic acid (1 in 300) be used. Many give carbolic acid the preference, because it does not cause coughing and sneezing, and is readily removed from the clothes by evaporation. Dr. Thiersch prefers salicylic acid, because it irritates the wound less. The sponges are kept in a solution of carbolic acid (1 in 20 of water); and, after being used, are washed with much warm water, and again placed in the carbolic acid solution. Salicylic acid solution may also be used.

Citrate of Iron and Bismuth. C. Rice. (*Druggists' Circular.*) Take of citrate of bismuth, ammonio-citrate of iron, each 320 grains; solution of ammonia, and water, each a sufficient quantity.

With four ounces of water rub the citrate of bismuth into a smooth paste; gradually add solution of ammonia until solution has taken place, being very careful not to have an excess of ammonia. Now add the ammonio-citrate of iron and some more water; dissolve, filter, and wash the filter with enough water to make the solution measure one pint.

This solution if intended to be long kept may be partly made up

with glycerin, although the author cannot speak from experience whether it is so well borne by the stomach. A more useful addition, however, is good sherry wine, of which there may be used 10 fluid ounces (or perhaps more) in place of so much water.

The above solution is prescribed under the name of liquor ferri et bismuthi citratis, and contains in 1 fluid dram $2\frac{1}{2}$ grains each of citrate of bismuth and ammonio-citrate of iron. The dose is from 1 to 2 fluid drams, half an hour before meals.

It is, of course, no true double salt, chemically speaking, but only a mixture of ammonio-citrate of bismuth and ammonio-citrate of iron; and although a true double salt containing those elements might perhaps be prepared, the author doubts whether it could have any better effects.

The solution may also be prepared in a concentrated state, and spread upon plates of glass to dry, yielding exceedingly handsome scales of a golden brown colour, which must be protected from the light, and 5 grains of which are equal to 1 fluid dram of the solution.

Solution of Citrate of Magnesium. J. C. Wharton. (*Tennessee Pharmacal Gazette*, July, 1874.) In preparing a solution of citrate of magnesium, a quicker process than that of the U.S. Pharmacopœia is frequently desirable. It also appears advantageous to employ calcined magnesia in place of the carbonate, as by the use of the former a considerable amount of heat is evolved, which aids in making a rapid solution.

The author suggests the following process, the result of which is substantially the same as the preparation of the U.S. Pharmacopœia.

First. Omit the syrup of citric acid.

Second. Prepare a syrup of bicarbonate of potassium, as follows:—

R. Simple Syrup	2 pts.
Spirit of Lemon	64 minims.
Bicarbonate of Potassium	640 grs.

Mix and dissolve.

Solution of Citrate of Magnesia.

R. Calcined Magnesia	88 grs.
Citric Acid	408 grs.
Syrup of Bicarbonate of Potassium	2 fl. oz.
Distilled Water, a sufficient quantity to fill the bottle.	

Mix the magnesia and citric acid in a mortar, with one and a half fluid ounces of water. After solution is effected, add the remainder of the water and strain if necessary. In bottling, pour the syrup in first, avoiding contact with the mouth and sides of the bottle as much as possible. Then pour upon it the solution as gently

No. 1 is an English formula, and gives a variety of cold cream; No. 2 is a formula used by a Cincinnati pharmacy; No. 3 is a modification of No. 2, by the addition of glycerin; No. 4 is in use in Philadelphia, Pa.; No. 5 is an English formula; No. 6 is from a Broadway, New York, pharmacy; No. 7 is of French origin; of No. 8 the pedigree is lost; Nos. 9 to 13 are formulæ of the writer, and have been extensively used for both wholesale and retail trade, and will give excellent results, with perfectly sweet materials. The perfume is not arbitrary, but can be mixed to suit one's taste.

The manipulation is easy to be understood; in the first and third formulæ it is similar to that of the cold cream of the Pharmacopœia; in all the others, the wax is to be melted first, then the cetaceum and lard, then the camphor, and finally, when sufficient cooled, the essential oils, and then cast in suitable moulds.

Liquor Opii Sedativus. P. Wells. (*Pharm. Journ.*, 3rd series, v., 281.) Twelve ounces of the finest Turkey opium, in coarse powder, are mixed with a proper quantity of clean sand, and completely exhausted by percolation with water.

The liquors are mixed, and after standing a few hours to deposit, are strained off, and evaporated over a naked fire in an enamelled pan by rather rapid ebullition to about three imperial quarts.

This is allowed to stand in an open jar or any other vessel for fully twelve hours, and then carefully strained through flannel to separate the resin and flocculent matter, and then boiled down to three pints. After standing for twelve hours in a cool place, it is filtered through paper, 14 ounces of rectified spirit, 60 o.p. added, and made up to four imperial pints with distilled water.

In about a week the preparation assumes the taste and smell peculiar to Battley's Solution.

Preparation of Saffranin. A. Ott. (*Moniteur Scientifique*, November, 1874.) The author recommends as the best method the treatment with syrupy arsenic acid of the azotised compounds obtained by acting with nitrous acid upon heavy aniline oils containing toluydin, and boiling at 198° to 200°. For the preparation of the nitrous acid he takes 1 part of starch, and 8 of nitric acid, heating in the water bath; the gas generated before being conducted into the aniline oil is not washed in water, but passed through sulphuric acid. When the aniline has become a maroon brown, and crystallizes on a watch glass, 100 parts are mixed with 90 parts of arsenic acid at 72 per cent. To prevent a too rapid rise of temperature, the arsenic acid is introduced very gradually. The mass is then heated on the sand bath till a violet

coloration appears. According to Reimann (*Farber Zeitung*, No. 41, 1871), the application of heat for five minutes is sufficient. The author finds that in operating upon 50 grams, it is necessary to heat for at least two hours. The whole is then boiled with water containing lime, in which the violet colouring matter is insoluble. To remove the deposit formed, the whole is poured upon flannel filters, beneath which is a layer of sand. The filtrate is slightly saturated with hydrochloric acid, and an excess of chloride of sodium is added. The precipitated saffranin is purified by solution in acidulated water, and re-precipitation with salt.

Harmless Face Powder. Hans M. Wilder. (*Amer. Journ. Pharm.*, v., 7.) The apothecaries in Copenhagen (Denmark), have agreed on the following two compositions as substitutes for the numerous, generally poisonous, fashionable face powders.

White.

R	Oxide of Zinc	30 grams.
	Wheat Starch	250 "
	Oil of Rose	3 drops.

Red.

R	Carmine	1 gram.
	Carbon. of Magnesia	4 grams.

Betton's Dentifrice. (*Amer. Journ. Pharm.*, v., 10.)

R	Powdered Cuttle-fish,	
	" Orris Root, each	4 lbs.
	" Prepared Chalk	1 lb.
	Musk	8 grs.
	Oil Rose and Lavender (Mitcham), each	48 drops.
	Carmine, No. 40	2 drs.
	Solution of Ammonia	5 fl. drs.
	Water	6 fl. oz.

Rub the carmine with the solution of ammonia diluted with the water, and with this solution imbue the prepared chalk and powdered cuttle-fish bone. After the moisture has all disappeared, sift the orris root perfumed with the essential oils together with the coloured lime salts.

Piesse's Cuttle-fish Powder.

R	Powdered Cuttle-fish	$\frac{1}{2}$ lb.
	Precipitated Carbonate of Lime	1 "
	Powdered Orris Root	$\frac{1}{2}$ "
	Oil Lemon	1 oz.
	Oil of Neroli	$\frac{1}{4}$ "
	Carmine	$\frac{1}{2}$ dr.
	Solution of Ammonia	2 fl. drs.
	Water	1 $\frac{1}{2}$ fl. ozs.

Proceed as in former recipe.

Deer Tongue in Perfumery. Dr. A. W. Miller. (*Amer. Journ. Pharm.*, 4th series, v., 116.) Deer tongue, or southern vanilla (*Liatris odoratissima*, Wild.), seems destined to become a commercial staple of some importance, chiefly, so far, on account of its large consumption as a flavour for tobacco. It is stated to be also used to some extent in the South for the purpose of preserving clothing, woollen fabrics, etc., from the attacks of moths.

The author suggests the application of its highly odoriferous leaves in perfumery, and states that it is specially adapted to imitating the odour of new mown hay. He recommends the following formula.

Tincture of Deer Tongue.—Percolate two ounces of ground deer tongue leaves with cologne spirits until one pint of tincture is obtained. This is of a handsome light-green colour, so that it can be readily employed as an addition to various extracts, colognes, or toilet waters. In its pure state, it may be used as a substitute for the essence of May wine (a tincture of the fresh leaves of *Asperula odorata*), which is used extensively in Germany as a pleasant addition to wine, converting it into the so-called May drink (*Maitrank*).

Extract of New-mown Hay.

R	Tincture of Deer Tongue	8 oz.
	Extract of Rose from Pomade	4 „
	„ „ Orange Flower from Pomade	4 „
	Oil of Rose, Virgin Serail	16 drops.

New-mown Hay Sachet Powders.

R	Ground Deer Tongue Leaves	2 oz.
	„ Florentine Orris Root,	
	„ Damascene Rose Petals,	
	„ Orange Flowers, of each	1 oz.

Mix thoroughly and sift.

Sachet Bouquet.

R	Ground Deer Tongue Leaves	2 oz.
	„ White Santal Wood	½ „
	„ Florentine Orris Root	1 „
	„ Ambretta Seeds	¼ „
	„ Benzoin	¼ „
	„ Damascene Rose Leaves	1 „

Mix, and sift to remove coarse particles.

Medicated Soaps. (*Pharmacist, April, 1875, 122.*)*Arsenical Soap.*

- R Camphor, in fine powder . . . }
 Arsenious Acid, in fine powder . . . } 1 part of each.
 Castile Soap, white, in fine powder }
 Carbonate of Potassium 12 parts.

Mix, and make into a paste with water. Used in preserving the skins of birds and other small animals.

Chlorinated Soap.

- R Castile Soap, in fine powder . . . 11 parts.
 Chlorinated Lime, dry and good . . . 1 part.

Mix, beat them into a mass with sufficient perfumed spirit.

Iodine Soap.

- R Castile Soap, white . . . 16 parts.
 Iodide of Potassium . . . 1 part.
 Water . . . 3 parts.

Dissolve the iodide of potassium in the water, slice the soap, and place in a glass or porcelain vessel, and by the heat of a water bath melt them together.

Mercurial Soap.

- R Castile Soap, in fine powder . . . 32 parts.
 Corrosive Chloride of Mercury . . . 1 part.

Dissolve the chloride of mercury in about eight parts of perfumed alcohol, and beat it with the powdered soap into a uniform mass, in a porcelain or wedgwood mortar.

Tar Soap.

- R Tar (wood) . . . 1 part.
 Castile Soap (in shavings) . . . 2 parts.
 Solution of Potassa . . . 2 "

Beat them together until they unite.

Turpentine Soap. (Starkey's Soap.)

- R Carbonate of Potassium . . . }
 Oil of Turpentine } equal parts.
 Venice Turpentine }

Triturate them together in a warm mortar with a little water until they combine.

Sweet Wine of Iron. (*Proceedings Amer. Pharm. Assoc.*, 1874.)

℞ Pulverized Bitter Orange-peel . . .	½ troy oz.
Pulverized Calisaya Bark . . .	1 "
Citric Acid . . .	½ "
Citrate of Iron and Ammonium . . .	2 "
Distilled Water . . .	32 fl. oz.
Sherry Wine. . .	64 "
Saturated Tincture of fresh sweet Orange peel . . .	16 "
Deodorized Alcohol . . .	16 "
Syrup of Orange-peel . . .	16 "

Mix, macerate, and filter. Dose.—One teaspoonful.

Syrup of Ferrous Phosphate prepared from Metallic Iron.

H. W. Jones. (*Pharm. Journ.*, 3rd series, v., 541.) As phosphate of iron precipitated from mixed solutions of sulphate of iron and phosphate of soda is extremely difficult to wash, and very liable to oxidation, it occurred to the author to prepare the phosphate direct from metallic iron by means of phosphoric acid. By this means a syrup is obtained, which keeps remarkably well, which is free from the usual impurities, and contains the ferrous phosphate in an unoxidized condition, requiring less free acid to keep it in solution.

To prepare the syrup, cover the bottom of a jar or bottle, fitted with a cork, with coarse pure iron filings, and pour in phosphoric acid of about twice the strength of the diluted acid of the Pharmacopœia. Fit in the cork somewhat loosely, and let it stand for four or five hours. Action commences almost immediately, ferrous orthophosphate ($\text{Fe}_3\text{P}_2\text{O}_8$) is formed, and kept in solution by the free acid present. The hydrogen eliminated forms a hydrogen atmosphere in the jar, and prevents oxidation of the phosphate. At the end of the time named, the action will somewhat have ceased, and an acid solution of phosphate of iron will have been formed. To determine the proportion of iron in the solution, filter off 10 c.c., and titrate immediately with bichromate (B.P. solution) after the addition of hydrochloric acid and water. Each c.c. of bichromate = .0358 gram $\text{Fe}_3\text{P}_2\text{O}_8$. If the operation has been properly conducted the iron will all be present in the ferrous state, so that the bichromate will give the total iron present. Having found out how much is contained in 10 c.c. we have only to multiply the number of grams found by 5.4, when we have the number of grains of phosphate present in each fluid dram of the liquor. Filter the remaining liquor, which, when poured off the iron, runs through paper quickly, and add sufficient syrup so that each fluid dram shall contain one grain of phosphate of iron. If an acid of the strength

named be left on the iron for five hours, more strong acid must be added to the syrup till it acquires a decidedly acid taste, when it will keep well. If it be considered a matter of importance that a definite amount of free acid should be present, note the specific gravity of the original acid, and calculate the amount of phosphoric acid removed by the iron. With an acid of known specific gravity, and, therefore, of known percentage of phosphoric acid, the bichromate solution gives with little calculation (1) the amount of phosphoric acid removed by the iron, and (2) the amount of free acid in the solution. The required quantity of acid can then be added. The Pharmacopœia syrup is much too acid, and 15 minims of acid phosph. dil. in the dram will be found quite enough, and the syrup will keep well with 12 minims. If the process be well conducted, no phosphate of iron will be lost by precipitation. A solution seven times the strength of the syrup can be readily formed, which when mixed off with syrup forms an elegant preparation.

Aniline Black Marking Ink. (*Moniteur Scientifique*, April, 1875.) Dr. Jacobson's ink is prepared by means of two solutions, one of copper, the other aniline, composed as follows:—

(1.) *Copper Solution*.—8·52 grams of crystallized chloride of copper, 10·65 grams of chlorate of soda, and 5·35 grams of chloride of ammonium are dissolved in 60 grams of water.

(2.) *Aniline Solution*.—20 grams of hydrochlorate of aniline are dissolved in 30 grams of distilled water, and to this are added 20 grams of solution of gum arabic (1 part of gum to 2 of water) and 10 grams of glycerin.

By mixing in the cold 4 parts of the aniline solution with 1 part of the copper solution, a greenish liquid is obtained, which can be employed directly for the marking; but as this liquid can only be preserved a few days without decomposition, it is advisable to keep the solutions separately until the ink is required for use. The ink may be used either with a pen or a stencil plate and brush; if it do not flow freely from the pen it may be diluted with a little water without fear of weakening the intensity of the colour. At first the writing appears of a pale green colour, but after exposure to the air it becomes black; or it may be changed to a black colour immediately by passing a hot iron over the back of the fabric, or heating it over the flame of a spirit lamp. As, however, a dry heat is apt to make the fibre saturated with the ink brittle, it is preferable to hold the marked fabric over a vessel containing water in full ebullition; the heat of the vapour is sufficient to determine almost immediately the reaction by which aniline black is formed.

After the steaming the writing should be washed in hot soap-suds which gives the ink a fine blue shade. The ink is not acted on by acids or alkalies, and if care be taken that the fibres are well saturated with it there is no danger of it being removed by washing.

Toothache Drops. The following four recipes for "toothache drops," are quoted in the *American Journal of Pharmacy*, from the *Dental Cosmos* for November, 1874.

- 1.—Chloroform,
Sydenham's Laudanum aa ʒij.
Tinct. Benzoin ʒj.
- 2.—Creasot,
Chloroform aa ʒij.
Sydenham's Laudanum ʒiv.
Tinct. Benzoin ʒj.
- 3.—Oil of Peppermint,
Rhigalene,
Chloroform aa ʒiij.
Camphor ʒj.
- 4.—Chloral
Camphor aa ʒj.
Morphia gr. ij.
Oil of Peppermint ʒij.

Improved Glycerin Cement. (*Pharmacist*, Sept. 1874, 284.)

A cement of great value for many purposes, and capable of being used where resistance to both the action of water and to that of heat is required, is composed by mixing glycerin with dry litharge, so as to constitute a tough paste. For uniting the joints of steam-pipes and other similar applications this preparation is said to be very satisfactory.

Ferrated Cod-Liver Oil. (*Pharmaceutische Centralhalle*.) Benzoate of iron is one of the ferrous combinations which is soluble in the fatty oils. According to former experiments it has been proved that the benzoate is preferable to most of the other forms of iron, not only on account of its ready solubility, but also for having a less nauseous taste, which so strongly characterizes most of the cod-liver oils impregnated with iron in different ways.

The solubility of the benzoate of iron in cod-liver oil is dependent chiefly upon the amount of free fatty acids and gally constituents contained in the oil, and is increased by digestion at higher temperatures. A very convenient solution adapted for most requirements is made by taking 1 part of the combined iron to every 100 parts of oil. The largest quantity found soluble in 100 parts of an oil of good quality, and several years old, which

did not show any turbidity by being kept in a cellar were 1.63 parts. The same quantity of another but fresh oil dissolved 1.45 parts of the benzoate during a digestion of one day, and had formed but a minute sediment after a fortnight, holding then in clear solution 1.2 parts of the iron salt.

The following process for preparing benzoate of iron is recommended by Dr. Méhu: 10.0 grams of crystallized benzoic acid are dissolved in 200 c.c. of distilled water, and to this is added 15.0 c.c. or sufficient caustic liquor of ammonia of 10 per cent. till after moderate digestion the liquid remains slightly ammoniacal. 11.0 grams of the official solution of chloride of iron, specific gravity 1.480 previously diluted with 200 c.c. of hot distilled water, are next added to the liquid, and after stirring, it is left to deposit in a cool place for a day, then decanted, and the residue again stirred with cold water, and decanted as before. The remainder is washed in a filter and sufficient water poured on it, till the percolating liquid indicates but a minute reaction with nitrate of silver. The precipitate is dried on bibulous paper, pulverized, again subjected to a drying at a temperature of about 40° C. for a day, and at last preserved in a well stopped bottle protected from the light. The weight of it will be 12.0 grains. In order to prepare the ferrated oil, it is necessary to use the perfectly dry salt; of this 10.5 grams finely pulverized, are triturated with 4.0 grams of the oil. After repeated shaking for several days, it is set aside to deposit, and the supernatant brown liquid poured off. The residue is filtered through previously dried paper. To retain the original taste of this preparation, it should not be exposed to the light, as otherwise it may become disagreeable to the palate.

Tincture of Phosphorus (*Elixir of Phosphorus*). G. J. Luhn. (*Amer. Journ. Pharm.*, 4th series, iv., 308.)

R	Phosphorus	gr. j.
	Ether Sulph. Conc.	f 5i ss.
	Alcohol	f 3j.
	Tr. Ment. Pip.	f 3ss.
	Bower's Glycerin, q. s. to make	f 3iij.

The phosphorus completely dissolves in the ether in about twenty-four hours, care being taken to introduce no water into the ether with the phosphorus. After the solution of the phosphorus is effected, the alcohol may be added, but the glycerin should be added in small portions, and the mixture shaken after each addition, and allowed to stand until it becomes clear before another portion of the glycerin is introduced.

A great deal of care has to be exercised in the addition of the glycerin; if too much be added at a time it will disengage a quantity of phosphorus, which will fall to the bottom. The essence of peppermint may either be added with the alcohol, or as the last ingredient, the latter is preferable, especially if the preparation is not made with 95 per cent. alcohol. Some apothecaries use 80 per cent. alcohol in making it.

This preparation contains one twenty-fourth of a grain of phosphorus to each fluid dram, or teaspoonful. It is quite burning to the taste, but can easily be administered in a little simple syrup, when it will not be at all unpleasant to take. It has quite a milky appearance when mixed with syrup, but the author does not think the phosphorus is precipitated, at least not rapidly enough to prevent its being taken.

A mixture of this preparation with fluid extract of *nux vomica*, in the proportion of three drops of the latter to each fluid dram, has been styled compound elixir of phosphorus.

Syrupus Assafœtidæ. J. W. Wood. (*Amer. Journ. Pharm.*, 4th series, iv. 410.) An eligible syrup of assafœtida, that would be not unpleasant to the patient, and also keep a reasonable length of time without change, has long been a desideratum among physicians and pharmacists. Many formulæ have been published, but none seems to have met with general favour; and some produced so unstable a preparation as to render them altogether worthless. In experimenting on this subject, the admirable solvent properties of glycerin, and its slight medicinal activity, commended it as a suitable medium, and the results prove that a very desirable and not unhandsome preparation may be obtained as follows.

R	Assafœtida (select)	. . . . .	grs. 256.
	Glycerin	. . . . .	f 3ij.
	Alcohol, 95 per cent.	. . . . .	f 3ij.
	Oil of Gaultheria	. . . . .	gtt. xv.
	Oil of Cinnamon	. . . . .	gtt. v.
	Oil of Bitter Almonds	. . . . .	gtt. j.

Dissolve the assafœtida in the glycerin by the aid of a gentle heat, and strain if necessary. Dissolve the essential oils in the alcohol, and add to the above, after which add simple syrup sufficient to make the whole measure one pint, and incorporate thoroughly. Each fluid dram will represent two grains of the gum resin.

This is a perfectly stable preparation.

A sample, which the writer made over two years ago, does not appear to have deteriorated in the least.

A Palatable Emulsion of Castor Oil. C. W. Holmes. (*Pharmacist*, Oct., 1874, 318.)

R Gum Arabic, powdered	1 oz. troy.
Simple Syrup,	
Glycerin, of each	1 fl. oz.
Castor Oil	6 fl. oz.
Water	3 fl. oz.
Essence of Vanilla,	
Brandy, of each	1 fl. drm.
Oil of Cinnamon	5 drops.

Misce fiat emulsio, lege artis.

Carbolated Tannate of Lead Ointment. (*Pharmacist*, Oct., 1874, 320.)

R Tannic Acid	18 grs.
Carbolated Ointment	1 troy oz.
Solution of subacetate of Lead	1 fl. drm. Mix.

This is said to be an excellent soothing and healing ointment for piles, chafing, etc.

Astringent Rose-Leaf Tablets. (*Pharmacist*, Sept., 1874, 282.)

R Red Rose, in fine powder.	3 oz.
Catechu	3 oz.
Tragacanth	$\frac{1}{2}$ an oz.
Sugar	24 oz.
Oil of Rose	25 drops.

Rub the powders together until they are thoroughly mixed, then add the oil of rose, and when incorporated, form a mass with sufficient rose water, and divide in troches weighing ten grains each.

On the Use of Methyl Ether as a Freezing Agent, and its Application to the Preservation of Meat. C. Tellier. (*Ann. Chim. Phys.*, 5th series, iii., 502; *Journ. Chem. Soc.*, 2nd series, xiii., 488.) Methyl ether is liquid at -30° , under the normal atmospheric pressure; at 0° a pressure of 2.5 atmospheres renders it liquid, and at 30° 6.5 atmospheres; when it is allowed to evaporate, under a pressure of $1\frac{1}{2}$ atmosphere, it lowers the temperature of substances with which it is in contact to -15° .

The apparatus employed in its manufacture on the large scale consists of a metal retort, into which are introduced equal quantities of methyl alcohol and sulphuric acid. The mixture is heated by means of a worm in the interior, through which superheated steam is blown. The temperature during the operation should not

exceed 125° – 128° . The methyl ether prevents the corrosion of the metal by the sulphuric acid. The gas evolved is passed through a worm to condense any condensable vapours that are carried over; then through a solution of caustic potash, to remove acid fumes, and next over calcium chloride to dry the methyl ether; from the calcium chloride it passes into a force pump, and escapes through a worm into a "condenser" surrounded by cold water, from which it flows in the liquid state into an iron reservoir. A bituminous mass is left in the retort, which must be removed after each operation.

The apparatus for the manufacture of ice consists of a reservoir containing liquid methyl ether, a series of pipes, through which the cold vapour is allowed to escape into a force-pump, which compresses the vapour into a condenser, from which it again boils into the pipes. If air be driven by a fan against the pipes, the temperature is lowered to 0° .

An extract from the report of the *Académie des Sciences* is added, with particulars relating to the appearance of the meat preserved by Tellier's process. The air, cooled as described above, is admitted into a chamber in which the meat is kept. For the first week there is little difference between the preserved meat and fresh meat. In course of time the outside becomes dry. In thirty days the weight of the meat decreases 10 per cent.; after some time, however, it loses moisture much more slowly. The meat becomes more tender, but is always fresh. It differs slightly in taste from freshly killed meat, but is nevertheless quite palatable. Meat kept for eight months in the cold chamber, was at the end of that time perfectly edible.

Green Bronze for Iron. P. Weiskopf. (*Dingl. polyt. Journ.*, cexiii., 358; *Journ. Chem. Soc.*, 2nd series, xiii., 492.) One part of silver sylvate is dissolved in twenty parts of lavender oil, and applied, by means of a hair pencil, to the clean and dry surface of the iron, which is then quickly warmed to 150° . The iron may now be electro-coppered, as this metal does not touch the bronzed portions.

Method of Extinguishing Burning Petroleum. (*Dingl. polyt. Journ.*, cexiv., 421; *Journ. Chem. Soc.*, 2nd series, xiii., 492.) The vapour of one part of chloroform will extinguish sixty parts of burning petroleum. It is recommended that all oil works keep a certain amount of chloroform, so that in case of a fire the chloroform vapour may put it out.

Preparation of Artificial Alizarin. A. Ott. (*Chem. News.*, xxx., 113; *Journ. Chem. Soc.*, 2nd series, xiii., 197.) The method now

generally adopted by manufacturers is that described in the patent of Graebe, Liebermann & Caro, dated June 25th, 1869. It is based upon the oxidation of anthracene to anthraquinone, the conversion of anthraquinone into the bisulpho-combination by means of sulphuric acid, and the melting of the corresponding soda-salt with sodium hydrate, whereby alizarin is formed. Anthraquinone is produced by heating anthracene with potassium bichromate and sulphuric acid until no further reaction takes place; many manufacturers using a little nitric acid towards the end of the reaction. The crude product is purified by dissolving it in strong sulphuric acid at 70°, with which it is left in contact until fumes of sulphurous acid cease to be disengaged. It is then precipitated by water, washed, pressed, and dried at 50°, and then forms a greenish grey impalpable powder. This powder is then converted into bisulphanthraquinonic acid by heating it to 270°–290° with four or five times its weight of fuming oil of vitriol. The product when cold is a solid pitch-like mass, which is exhausted with boiling water and saturated with chalk, whereby a lime salt of the bisulpho-acid is formed. The filtered liquid is decomposed by sodium carbonate, siphoned off, evaporated to 20° B., and allowed to cool. The sediment yields alizarin with a bluish tinge, while that yielded by the liquid has a yellowish tint, probably due to the presence of a distinct yellow colouring matter.

The sulpho-salt is converted into alizarin by heating it in iron vessels at 170°–200° with sodium hydrate. When the process is completed, the contents are dissolved in water and the alizarin precipitated by hydrochloric or sulphuric acid.

Dry Syrup of Almonds. Dr. Enders. (*Archiv der Pharmacie*, 1874, i., 511.) To avoid the inconveniences resulting from the separation and rapid decomposition of almond syrup, the author suggests a dry preparation from which the syrup may be very easily obtained. Twenty parts of sweet almonds are made into an emulsion with sufficient distilled water; the emulsion is mixed with seventy-two parts of sugar, and in a steam-bath rapidly evaporated to dryness; the residue is powdered, and kept in well corked phials. To prepare one hundred parts of syrup, sixty-eight parts of this powder are dissolved in twenty-four parts of water by the aid of heat, and then five parts of orange-flower water and three parts of bitter almond water are added.

Paraffin Ointment, a Substitute for Cosmoline and Vaseline. J. L. Lemberger and A. W. Miller. (*Amer. Journ. Pharm.*, 4th series, v., 257.) *Preparation.*—Procure a cylindrical percolator, having a

height of from ten to twenty times its diameter, and arranged so that it can be maintained at a temperature of about 150° F. by a steam or water bath. Introduce a diaphragm having about 300 perforations to the square inch, or tie a coarse cloth over the nozzle. Fill the percolator nearly to the top with granulated animal charcoal. Then allow the rectified residuum of Smith's Ferry petroleum, of 30° Beaumé gravity, to percolate through. Reserve as much of the percolate as is nearly free from colour, odour, and taste. Pass the succeeding portions through a second percolator arranged in the same manner, and when this ceases to decolourise and deodorize sufficiently, pour those portions which have already passed through the first and second percolators upon a third one. At every operation reserve those first portions of oil which are very light in colour, and nearly devoid of the petroleum taste and smell. Add 16 parts of this purified oil to one part of best white, hard paraffin, which has been previously melted by means of a waterbath.

Beeswax combines readily with the oil, and seems also to have the power of masking the petroleum odour, when this has not been completely removed. The following formula is suggested as an elegant substitute for simple cerate :—

Paraffin Cerate. Ceratum Paraffini.

Pure Beeswax	1 part.
Purified Paraffin Oil	9 parts.

Melt the beeswax on a water bath and add the oil.

Paraffin ointment seems to be peculiarly adapted for use as an application to the hair, as the hydrocarbons composing it are not, like other oils, prone to combine with oxygen. It can be conveniently perfumed with any desirable odour.

Paraffin Pomade.

Paraffin Ointment	10 oz.
Oil of Rose	20 drops.
Oil of Bergamot	30 drops.

Coloured Inks. (*Boston Journal of Chemistry.*) The following recipes are stated to have been well tested, and to be recommended by good authorities as preferable to the solutions of aniline dyes which are now so extensively used as coloured inks :—

Green.—Two parts of acetate of copper, one part carbonate of potash, and eight parts water. Boil till half is evaporated, and filter.

Blue.—Three parts Prussian blue, one part oxalic acid, and thirty parts of water. When dissolved, add one part of gum arabic.

Yellow.—One part fine orpiment, well rubbed up with four parts thick gum-water.

Red.—With the aid of a gentle heat, dissolve four grains of carmine in one ounce of aqua ammonia, and add six grains of gum-arabic.

Gold.—Rub gold-leaf, such as is used by bookbinders, with honey till it forms a uniform mixture. When the honey has been washed out with water, the gold powder will settle at the bottom, and must be mixed with gum-water in sufficient quantity.

Silver.—Silver-leaf treated in precisely the same manner gives a silver ink. Both these inks may, when dry, be polished with ivory.

Black.—Three ounces crushed gall-nuts, two ounces crystallized sulphate of iron, two ounces gum-arabic, and twenty-four ounces, water.

White.—Fine French zinc-white, or white lead, rubbed up with gum-water to the proper consistency.

Cod-Liver Oil with Quinine. M. H. Stiles. (*Pharm. Journ.*, 3rd series, v., 641.) The preparation may be made as follows:—

R	Sulphate of Quinine	60 grs.
	Diluted Sulphuric Acid	1 fl. dr.
	Solution of Ammonia	a sufficiency.
	Distilled water	a sufficiency.
	Purified Oleic Acid	1 fl. oz.
	Cod-Liver Oil	29 fl. oz.

Dissolve the quinine in the diluted sulphuric acid mixed with four ounces of water, add a slight excess of ammonia, stir well, transfer the whole to a calico filter, and after carefully washing the precipitate, press it between folds of bibulous paper, and dry it by the heat of a water bath. Dissolve the quinine thus obtained in the oleic acid by the aid of a gentle heat, mix the solution whilst warm with 5 oz. of cod-liver oil also warm, strain through cotton wool or filter through paper if necessary, then add the remainder of the oil. The product should measure 30 fl. oz.; each table-spoonful (fl. ʒss.) contains oleate of quinine equal to one grain of sulphate.

The above preparation has the characteristic taste of quinine and cod-liver oil, the oleic acid from its small amount not being perceptible.

A sample prepared two months ago has kept well, being quite clear, and as free from deposit and objectionable odour as on the day it was made.

Modification of Fehling's Solution, as employed for the Determin-

ation of Glucose. M. P. Lagrange. (*Comptes Rendus*, November 2nd, 1874.) The author proposes the following formula :—

Dry Neutral Tartrate of Copper.	10 grs.
Pure Caustic Soda	400 „
Distilled Water	500 „

The tartrate of copper is obtained by decomposing the sulphate of copper with neutral tartrate of soda, the precipitate being washed by decantation, and dried at 100° C.

Refrigerating Mixtures of Snow and Sulphuric Acid. Prof. D. L. Pfaundler. (*Auzeig. K. Akad. d. Wiss. Wien*, 1875, No. 9; *Amer. Journ. Pharm.*, 4th series, v., 267.) The author has instituted a series of investigations on this subject, showing that an acid containing 66.19 per cent. H_2SO_4 is the most advantageous for the purpose; 1 part of it with 1.097 parts of snow will reduce the temperature to -37° C. (-30.6° F.), but for practical purposes an excess of snow will be better, since the refrigerating value of the mixture is thereby largely increased, though the lowest temperature is not attained.

Cauterizing Pencils of Sulphate of Copper. W. Steffen. (*Pharm. Central.*, 1875, No. 11; *Amer. Journ. Pharm.*, 4th series, v., 267.) These pencils are best prepared by heating the crystals slowly in a porcelain dish, stirring constantly. The salt fuses at first, and after a short time acquires a pasty consistence; the plastic mass is now rolled out upon a warm board or plate, like a pill mass, into any desired form, thickness, or length. Such pencils may be kept for years, and can be pointed like a lead pencil. Pencils of alum and of a mixture of alum and sulphate of copper may be made in the same manner. After a few trials the proper degree of consistency is easily attained.

Mucilage for Minerals, etc. (*Amer. Journ. Pharm.*, 4th series, v., 225.) Professor R. P. Whitfield, palæontologist, of Albany, N.Y., gives the following recipe for mucilage to mend fossils and minerals :—

℞ Starch	3ij.
White Sugar	5j.
Gum Arabic	3ij.
Water	q. s.

Dissolve the gum, add sugar, and boil until the starch is cooked.

Prof. W. is in the habit of drying it into sheets, on paper, and redissolving when wanted.

It is a very adhesive mucilage, and, owing to the sugar, never

becomes brittle or scales off, as most glues do, from stones or other hard substances.

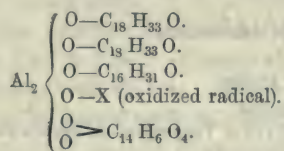
Imitation of Walnut Wood. *Dingler's Polytechnic Journal*, vol. 214, p. 426, gives the following directions for staining wood, and more particularly the European red beech and alder, in close imitation of American walnut:—Well dried and warm wood is impregnated once or twice with a solution of 1 part of extract of green walnut rinds in 6 parts of soft water, and before it is quite dry, a solution of 1 part of bichromate of potassium in 5 parts of boiling water is applied. The wood is allowed to dry thoroughly, when it may be polished in the usual way.

Red Marking Ink. Th. Wegler. (*Pharm. Centralhalle*, 1874, No. 44.) Egg albumen is diluted with an equal weight of water, rapidly stirred with a glass rod until it foams, and then filtered through linen. The filtrate is mixed with a sufficient quantity of finely levigated vermilion until a rather thick liquid is obtained, which is used for marking with a quill; the back of the linen is then pressed with a hot flatiron, whereby the albumen is coagulated; the marking is affected neither by soap, alkalies, or acids. The ink may be preserved for a long time, in well corked vials, without depositing the vermilion.

The Restoration of Writing Effaced by Sea Water. Thomas Garside. (*Pharm. Journ.*, 3rd series, v., 1006.) A letter which had been submerged in the wreck of the unfortunate *Schiller*, and in which the writing was quite illegible, was shown to the author, with the request that he would restore it. As the method adopted proved completely successful, the author describes it for the benefit of those who may be called upon under similar circumstances. The letter was carefully brushed over with solution of sulphocyanide of potassium (1 in 20) and then, still damp, held over a dish containing hot hydrochloric acid. The writing was thus developed of a deep red colour. The rationale of the process is this: The iron of the ink is precipitated as peroxide upon the fibres of the paper, and remains when all other colouring matters are washed away. Being in an insoluble form, however, no effect is produced by the reagent until the fumes of the acid have rendered it soluble. Probably ferrocyanide of potassium would answer as well or better than sulphocyanide.

Turkey Red. A. Romegialli. (*Gazetta Chimica Italiana*, iv., 256-266; *Journ. Chem. Soc.*, 2nd series, xiii., 491.) The subject of dyeing with Turkey red was attacked analytically and synthetically. The author concludes that this dye owes its efficacy to

three conditions :—(1) The presence of a lake of alizarin, alumina, and a fatty acid; (2) A compound of a neutral fatty body and alizarin; (3) An excess of the neutral fatty substance in which (1) and (2) are dissolved. He describes his efforts to form the dye synthetically, and thinks success will ultimately be obtained by proceeding in the same direction, although he has for the present failed. He believes that the constitution of the colour may be represented by the following formula, in which the 6 H of $\text{Al}_2 \text{H}_6 \text{O}_6$ are replaced partly by oxidized, partly by unoxidized, radicals of fatty acids, and partly by the residue of alizarin.



Portland Cement from Dolomitic Limestone. S. Erdmenger. (*Dingl. polyt. Journ.*, ccxi., 13-22, and ccxiv., 40-48; *Journ. Chem. Soc.*, 2nd series, xiii., 672.) The author has already shown that a cement may be prepared from dolomitic limestone, which hardens under water more quickly than the ordinary cement. (*Chem. Soc. Journ.*, 1874, 96). He now finds that, although the dolomitic cement hardens sooner, it never attains to the same degree of hardness as the ordinary cement. The dolomitic cement is more compact, and for many purposes is very useful.

The hardness of a cement increases as the proportion of water added is diminished, until a certain minimum limit is reached, this minimum varying with each sample. The hardness also depends upon the proportion between the lime and the acid constituents of the cement; in the best cements this proportion averages 1 : 1.79.

Coating Iron and Steel with Copper. (*Dingl. polyt. Journ.*, ccxiv., 536.) 1. The iron or steel object is dipped in fused copper, the surface of which is covered with a flux of cryolite and phosphoric acid. The object must be heated to the temperature of the fused metal.

2. The object, according to a second method, is dipped in a fused mixture consisting of 1 part of cupric chloride or fluoride, 5 to 6 parts of cryolite, and a little barium chloride. Contact of the dipped object with the negative pole of a battery hastens the coating process.

3. The body is dipped in a solution of cupric oxalate and sodium

bicarbonate in 10 to 15 times their bulk of water, this solution being moderately acidified with an organic acid (tartaric or oxalic).

Cream of Camphor. O. Kraus. (*Amer. Journ. Pharm.*, 4th series, v., 257.) Cream of camphor prepared according to the following formula, has been used successfully in inflammatory affections of the throat, also catarrhal and other pectoral complaints of children, it having the advantage over the linimentum ammoniæ, U.S.P., on account of being free from all oily matter.

To make Cream of Camphor.

White Castile Soap (in shavings)	℥jss.
Camphor	℥ij.
Carbonate of Ammonium	℥ij.
Water	Oiv.
Tincture of Opium	f℥j.
Oil of Origanum	f℥j.
Alcohol and Oil of Turpentine, of each a sufficient quantity.	

Dissolve the soap shavings in three pints of water, and set aside. Dissolve the carbonate of ammonium in the remainder of the water, and mix the two solutions. Then add the camphor, previously reduced with alcohol to a thin paste, and agitate briskly. Oil of turpentine is then to be added in sufficient quantity to bring the mixture to the consistence of a cream, on brisk agitation; after which the tincture of opium and oil of origanum are to be added,—then the whole is to be thoroughly mixed.

As it is readily absorbed by the skin, it may be applied by the hand, or by saturating a piece of flannel, and placing over the affected part.

Wine of Tar. J. B. Moore. (*Amer. Journ. Pharm.*, 4th series, v., 200.) The formula usually employed by pharmacists in making wine of tar is that recommended by the late Prof. Procter (*U.S. Dispensatory*, edition 1870, page 680), which, as is well known to all, is a troublesome and rather complicated process, while it affords a very unreliable product, feeble in tar strength and unsightly in appearance.

The copious mucilaginous deposit which takes place in the preparation on standing, when made by that process, appears to carry with it almost all the virtues of the tar which it may have contained when freshly made, and leaves the supernatant liquid of little more than the strength of ordinary tar water. This process of depletion seems to continue almost indefinitely.

To remedy this the author proposes the following formula:—

R	Pure tar	5xvj. troy.
	Glycerin,	
	Sherry wine,	
	Honey	aa f 5viij.
	Acetic Acid	f 5j.
	Boiling Water	Ovj.

Mix the glycerin, sherry wine, honey, acetic acid and boiling water together, in a stone jug or other suitable vessel of the capacity of a gallon. To the mixture add the tar, and shake the whole vigorously for several minutes. The vessel is then to be tightly stopped, and placed upon a stove or in a water bath, resting upon folds of paper, and the mixture digested for an hour or two, at a temperature of from 150° to 160°. During the digestion, the mixture should be frequently well shaken. When the digestion is completed, the mixture is to be set aside to macerate, in a warm place, for a few days, it being well shaken occasionally during the process. Lastly, strain through muslin, and filter the strained liquid through paper.

The addition of the acetic acid increases the solvent power of the menstruum and also imparts to the preparation the refrigerant properties of vinegar. The author can see no possible advantage to be derived from the fermentation process employed in the old formula, as it confers no special therapeutic value upon the preparation, while it renders its manufacture very tedious and troublesome.

Dyspepsia and the Use of Pepsin. Prof. Leube. (*Scientific American*, Aug. 8, 1874.) The views of Dr. Schacht concerning digestion have been confirmed by the author in a lecture just published on stomach diseases. He says:—1. No condition of the stomach has yet been observed in which pepsin is altogether absent. 2. The cause of indigestion is generally the absence of sufficient acid. 3. The action of pepsin in a solution of albumen resembles that of a ferment, and it will continue so to act without end, merely by the addition of more acid. 4. Alcoholic solutions, especially wine, on account of the tannin it contains, should be avoided as vehicles for pepsin. Finally he recommends in case of indigestion, a solution of chopped meat with water, adding a small proportion of pure muriatic acid and some thickening. He finds such a solution very nourishing, and reports excellent results. These views and experiments are not novel, but exhibit the old doctrine as to digestion, and it appears to be the sound one. The secretion of the pancreas is now thought necessary to the digestion of fatty substances; and

where these are used to any extent, as in cod-liver oil, it would be best to take the new medicine pancreatine, which acts best with an alkali instead of an acid, or to use a little of the solution of the pancreas of freshly killed animals.

Disappearance of Nitrogenous Organic Matter from Water running through Iron Pipes. A. Wynter Blyth. (*Chem. News*, xxx., 211; *Journ. Chem. Soc.*, 2nd series, xiii., 386.) The results recorded below were obtained with two waters, supplied (I.) to Barnstaple, (II.) to Ilfracombe. Under (I.), R gives the composition of the water in the reservoir, after passing through the filter beds; A, the composition half a mile distant from R; B, that half a mile from A; and C, that half a mile from B. Under (II.), A corresponds with (I.) R, and B represents the water taken at a point not named below A. The results are given in milligrams per litre:—

	Organic and Volatile Matter.	Fixed Solid Residue.	Total Solid Residue.	Ammonia (Free.)	Ammonia (Albuminoid.)	Nitrogen as Nitrates, etc.	Chlorine.
I. R.	40.0	60.0	100.0	0.060	0.090	2.30	16.14
„ A.	40.0	60.0	100.0	0.040	0.080	2.00	16.14
„ B.	40.0	60.0	100.0	0.035	0.075	2.00	16.14
„ C.	39.0	60.0	99.0	0.010	0.060	2.05	16.14
II. A.	70.0	140.0	210.0	0.060	0.140	Not determined.	21.43
„ B.	10.0	140.0	150.0	0.020	0.060		21.43

The ammonia of I. diminishes as the water gets more distant from R, but the nitrates show no increase. A similar diminution of ammonia takes place in II. The second and last columns show that the waters remain in other respects, the same. Both supplies are intermittent, and therefore oxidation might be the result of the formation of rust. The pipes, however, are never observed to have any coating of rust.

Expectorant Properties of Apomorphia. Dr. Jurasz. (*Med. and Surg. Reporter*, Oct. 24, 1874.) In the *Centralblatt*, for July 4th, the author points out that this drug has been proved to be a useful expectorant in all the cases in which it has been used, comprising cases of trachitis and bronchitis, and also inflammation of the larger and smaller bronchial tubes. The tenacious sputa were in all cases readily dislodged, and their discharge was greatly facilitated. The rhonchi, at first dry, blowing and whistling, became moist, and always diminished. The remedy was administered according to the following formula:—Hydrochlorate of apomorphia, 1 to 3 centigrams (0.15 to 0.46 grains); distilled water, 120 grams (4 ounces);

hydrochloric acid, 5 drops; simple syrup, 30 grams (about 1 ounce); a tablespoonful to be taken every two hours. The amount of apomorphia in each dose was thus from 1 to 3 milligrams (0.015 to 0.046 grain). The patients stated that the first spoonful caused slight uneasiness, which, however, did not follow the administration of the second dose. The hydrochloric acid was added to remove the tendency of the apomorphia to assume a green colour when in solution.

Remedies for Scabies. Prof. Bernatzik. (From the *Comментар zur Oesterr. Militär Pharmacopœe.*)

Linimentum Styracis Ph. mil. Austr. Storaxliniment.

R	Styracis Liquidi	400.0
	Olei Olivarum	100.0

In lebetem ferreum mundatum immissa calore balnei vaporis aquæ calefiant et tandiu agitentur donec mixtura refrigerit.

Sit massa homogœnea, cujus partes heterogenæ post longius tempus non discedunt.

Linimentum Styracinum Pastavii.

R	Styracis Liquidi	30.0
	Spiritus V. rectifss.	15.0

Leni calore mixtis conquassando admisce.

R	Olei Olivarum	45.0
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S. Ad duas permictiones post balneum calidum.

Dalwig proposes the following modification of Pastau's liniment.

Linimentum Styracinum Dalwigii.

R	Styracis Liquidi	36.0
	Olei Olivarum	8.0
	Spiritus V. rectifss.	4.0 M.

A still better modification of Pastau's liniment is given by Hager.

Linimentum Styracinum Hageri.

R	Styracis Liquidi	30.0
	Spiritus V. rectifss.	10.0
	Olei Ricini	5.0

In lagenam orificio amplo instructam immissa et paululum calefacta optime agitentur. Ad duas infrictiones in uno die adhibeantur. quæ ad scabiem depellendam plerumque sufficiunt.

Unguentum Styracis Sulfuratum Ph. milit. Austr.(Ungt. Styracis Weinbergii. *Styraxsalbe.*)

R	Adipis Suilli,	
	Saponis Viridis	aa 50.0
	Styracis Liquidi,	
	Cretæ Lævigatæ,	
	Sulfuris Subt. Pulv.	aa 25.0

Leni calore inter agitationem misceantur, tum agitentur, donec plane refrigerint.

Sit massa æquabilis pultiformis, coloris e viridi flavi, et odoris substyracini.

Unguentum Wilkinsonii (ad Hebra modificatum).

R	Florum Sulfuris,	
	Olei Fagi	aa 30.0
	(vel Picis Liquidæ	30.0)
	Saponis Domestici,	
	Adipis Suilli	aa 60.0
	Cretæ Lævigatæ	20.0

Liquor Inhalatorius contra Tussim Convulsivum. Dr. Wild.
(*Pharm. Centralhalle*, xvi., 19; from *D. Arch. f. klin. Med.*)

R	Chloroformi	30.0
	Ætheris	60.0
	Olei Terebinthinæ	10.0

M. D. S. A teaspoonful poured on a folded cloth to be inhaled at a distance of five to seven centimetres from the mouth during the attack.

With this remedy Dr. Wild has cured whooping cough in eight days.

Testing of Dye-stuffs. F. Föl. (*Dingl. polyt. Journ.*, ccxii., 520-524; *Journ. Chem. Soc.*, 2nd series, xiii., 193.)

A. *Blues*.—Solution of citric acid or dilute hydrochloric acid is added.

(a) Colour changes to red or orange. *Logwood blue.*

(b) Colour does not change.

Another part is treated with calcium chloride solution.

(a) Colour remains unchanged. *Prussian blue.*

(b) Colour changes.

Another part is treated with caustic soda.

(a) The substance is decolourised. *Aniline blue.*

(b) It remains unchanged. *Indigo blue.*

B. *Yellows*.—A portion is tested for ferric oxide by means of

potassium ferrocyanide; another part is tested for picric acid by means of potassium cyanide solution. The production of a blood-red colour indicates picric acid.

If the colours are absent, another portion is treated with a boiling soap solution (one part of soap in 200 of water).

(a) The colour changes to brown, but becomes yellow again with an acid. *Turmeric*.

(b) The colour becomes very dark. *Fustick*.

(c) The colour remains unchanged. *Wild Persian berries*, or *quercitron*.

Another portion is boiled with stannous chloride.

(a) The colour remains unchanged. *Quercitron*.

(b) The colour changes to orange. *Persian berries*.

If *annatto* is the colouring matter present, the colour changes to greenish blue on boiling in concentrated sulphuric acid.

C. *Reds*.—The substance is treated with boiling soap solution.

(a) The colour is totally discharged. *Saffron carmine*.

(b) The colour is slightly discharged. *Aniline red*.

(c) The colour changes to yellowish red or yellow. *Brazil wood* or *cochineal*.

A part of the substance is treated with concentrated sulphuric acid.

(1) A cherry red colour is produced. *Brazil wood*.

(2) A yellowish orange colour is produced. *Cochineal*.

(d) The colour remains unchanged. *Madder red*. This colour is not discharged by ammonium chloride, or by a mixture of equal parts of stannous chloride, hydrochloric acid, and water.

D. *Greens*.—These colours may consist of a mixture of blues and yellows, or of such substances as aniline green.

The substance is heated with alcohol of 95 per cent. in a water bath.

I. The alcohol is coloured yellow, while the substance becomes more and more blue. *Indigo* or *Prussian blue* is present. The residue is washed and tested for these blues, as already directed. The alcoholic liquid is tested for yellows, as above.

II. The alcohol is coloured green, while the substance becomes less coloured. *Aniline green* or a mixture of *aniline blue* with *yellow* is present.

A part of the substance is boiled with dilute hydrochloric acid.

(a) The liquid is coloured blue or lilac. *Aniline green from methyl iodide* is present.

(b) The substance is decolourised. *Aniline green from aldehyde*.

(c) The substance is coloured blue, while the liquid becomes yellow. *Aniline blue mixed with yellow.*

E. *Violets*.—The substance is boiled in calcium chloride solution.

(a) It is unchanged. *Alcanna violet.*

(b) It is coloured nanqueen yellow. *Madder violet.*

(c) It is decolourised. *Cochineal violet.*

Another portion is boiled in citric acid ; the colour is brightened. *Aniline violet.*

To distinguish between the two aniline violets, a third part is boiled in hydrochloric acid, which is diluted with three times its volume of water. After washing it appears blue violet if ordinary aniline violet is the colour, while if Hofmann's violet is present the substance appears greenish, and after washing light lilac or bluish.

TRANSACTIONS
OF THE
British Pharmaceutical Conference
AT THE
TWELFTH ANNUAL MEETING
AT
BRISTOL.
1875.

EDITED BY
PROFESSOR ATTFIELD.

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British Pharmaceutical Conference.

CONSTITUTION.

Art. I. This Association shall be called The British Pharmaceutical Conference, and its objects shall be the following:—

1. To hold an annual Conference of those engaged in the practice, or interested in the advancement, of Pharmacy, with the view of promoting their friendly reunion, and increasing their facilities for the cultivation of Pharmaceutical Science.
2. To determine what questions in Pharmaceutical Science require investigation, and when practicable, to allot them to individuals or committees to report thereon.
3. To maintain uncompromisingly the principle of purity in Medicine.
4. To form a bond of union amongst the various associations established for the advancement of Pharmacy, by receiving from them delegates to the annual Conference.

Art. II.—Membership in the Conference shall not be considered as conferring any guarantee of professional competency.

RULES.

1. Any person desiring to become a member of the Conference shall be nominated in writing by a member, and be balloted for at a general meeting of the members, two-thirds of the votes given being needful for his election. If the application be made during the recess, the Executive Committee may elect the candidate by a unanimous vote.

2. The subscription shall be 7s. 6d. annually, which shall be due in advance upon July 1.

3. Any member whose subscription shall be more than two years in arrear, after written application, shall be liable to be removed from the list by the Executive Committee. Members may be expelled for improper conduct by a majority of three-fourths of those voting at a general meeting, provided that fourteen days' notice of such intention of expulsion has been sent by the Secretaries to each member of the Conference.

4. Every association established for the advancement of Pharmacy shall, during its recognition by the Conference, be entitled to send delegates to the annual meeting.

5. The Officers of the Conference shall be a President, four Vice-presidents by election, the past Presidents (who shall be Vice-presidents), a Treasurer, two General Secretaries, one Local Secretary, and nine other members, who shall collectively constitute the Executive Committee. Three members of the Executive Committee to retire annually by ballot, the remainder being eligible for re-election. They shall be elected at each annual meeting, by ballot of those present.

6. At each Conference, it shall be determined at what place and time to hold that of the next year.

7. Two members shall be elected by the Conference to audit the Treasurer's accounts, such audited accounts to be presented annually.

8. The Executive Committee shall present a report of proceedings annually.

9. These rules shall not be altered except at an annual meeting of the members.

10. Reports on subjects entrusted to individuals or committees for investigation shall be presented to a future meeting of the Conference, whose property they shall become. All reports shall be presented to the Executive Committee at least fourteen days before the annual meeting.

. Authors are specially requested to send the titles of their Papers to either of the General Secretaries two or three weeks before the Annual Meeting. The subjects will then be extensively advertised, and thus full interest will be secured.

FORM OF NOMINATION.

I Nominate

(Name)

(Address)

as a Member of the British Pharmaceutical Conference.

Member.

Date

The nomination must be legibly written, and forwarded to one of the Honorary General Secretaries, Prof. ATTFIELD, 17, Bloomsbury Square, W.C., or F. BADEN BERGER, F.C.S., 7, Exchange Street, Royal Exchange, Manchester, either of whom, or any other officer or member, will duly sign the paper.

Pupils and Assistants, as well as Principals, are invited to become members.

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 Smith, Dr. J., Liverpool Asylum, N.S.W. (Letters, etc., to Messrs. Maw, Son & Thompson).
 Speechley, Mr. E., Karachi (Mr. J. D. Adcock, Alcester).
 Spooner, Mr. F., 259, Pitt Street, Sydney, N.S.W.
 Taylor, Mr. W. C. (G.G.M.C., Fort, Bombay), care of G. Brownen, F.C.S., 143, New Bond Street, W.
 Thibon, Mons. Denis, 6, Rue de Pont Neuf, Nice, France.
 Thompson, Mr. G. B., 17, Court Street, Buffalo, U.S.A.
 Verge, Prof. C., M.D., Leval University, Quebec.
 Ward, Mr. M., Queen Street, Brisbane, Queensland.
 Watkins, Mr. R., Timarn, Canterbury, New Zealand (Letters, etc., to Mr. J. Wade, 194, Warwick Street, Pimlico, S.W.).
 Weekes, Mr. M., 219, Pitt Street, Sydney, N.S.W.
 Whitford, Mr. H. F., Grafton, N.S.W.
 Wood, C. H., F.C.S., Government Cinchona Plantations, Rungbee, near Darjeeling, India. (Letters, etc., to Mr. Baldock, 3, High Street, S. Norwood, S.E.)
 Woodward, C. M., M.D., 131, Huron Avenue, Port Huron, St. Clare Co., Michigan, U.S.A.
 Woolcott, Mr. H. C., Paramatta, N.S.W.
 Zambelletti, Sig. L., 5, Piazza San Carlo, Milan, Italy.

NOTICE.

Members will please report any inaccuracies in these lists to

PROFESSOR ATTFIELD, *Hon. Gen. Sec.*,
 17, Bloomsbury Square,
 London, W.C.

LIST OF MEMBERS.

For Alphabetical List of Towns, see page 457.

- Abbott, Mr. J., 145, Woodhouse Lane, Leeds.
 Abraham, Mr. J., 87, Bold Street, Liverpool.
 Abram, Mr. F. W., Market Place, East Dereham, Norfolk.
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 Adam, Mr. T., 440, St. Vincent Street, Glasgow.
 Adams, Mr. A. A., Woolston, Southampton.
 Adams, Mr. F., Stoke-on-Trent.
 Adams, Mr. J. H., Stoke-on-Trent.
 Adams, Mr. R. W., Park Place, Dover.
 Adlington, Mr. W. B., 1a, Weymouth Street, Portland Place, W.
 Agar, Mr. W., Westgate, Mansfield.
 Agnew, Mr. J., 278, Great Homer Street, Liverpool.
 Ainslie, Mr. W., 58, George Street, Edinburgh.
 Aitken, Mr. J., 44, Broughton Street, Edinburgh.
 Aitken, Mr. R., 338, Oxford Street, W.
 Aitken, Mr. W., 3, Pitt Street, Edinburgh.
 Akhurst, Mr. W. E., 8, Lamb's Conduit Street, W.C.
 Albright, Mr. A., Litherland Road, Liverpool.
 Albright, Mr. J., Penny Street, Lancaster.
 Alcock, Mr. H., 127, Gosford Street, Coventry.
 Alexander, Mr. J., 81, Athol Street, Liverpool.
 Allan, Mr. W., 73, Princes Street, Edinburgh.
 Allanson, Mr. C., Montpelier Parade, Low Harrowgate.
 Allatt, Mr. F. T., Frizington.
 Allchin, Mr. A., England House, Primrose Hill Road, N.W.
 Allen, A. H., F.C.S., 1, Surrey Street, Sheffield.
 Allen, C. A., M.D., M.R.C.S.L., L.M., L.A.H., 52, South Richmond Street, Dublin.
 Allen, Mr. H. W., King's Lynn, Norfolk.
 Allen, Mr. W. H., 3, Liverpool Terrace, Canning Town, Essex.
 Allis, Mr. F., Tewkesbury.
 Allison, Mr. E., 13, Blanket Row, Hull.
 Amooore, Mr. A. S., 173, Sloane Street, S.W.
 Amos, Mr. D., 1, Parade, Canterbury.
 Amyot, T. E., F.R.C.S., Diss.
 Anderson, Mr. A. B., 38, Princes Street, Dundee.
 Anderson, Mr. D. S., Forfar, N.B.
 Anderson, Mr. E. H., Denny, Stirlingshire.
 Anderson, Mr. H. D., Park House, Guernsey.
 Anderson, Mr. J., Musselburgh, Edinburgh.
 Andrews, Mr. C., Commercial Row, Pembroke Dock.
 Andrews, Mr. F., 23, Leinster Terrace, W.
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 Appleby, Mr. E. J., 8, Argyle Street, Bath.
 Applegate, Mr. E., 5, Hercules Terrace, Holloway Road, N.
 Appleyard, Mr. R., 50, Park Lane, Bradford.
 Arblaster, Mr. C. J., 40A, New Street, Birmingham.
 Archibald, Dr. G., Messrs. Hill & Underwood, Norwich.
 Archer, Mr. A., Ridgeway, near Chesterfield.
 Archer, Mr. J., Lechlade, Gloucestershire.
 Archer, Mr. J. S., Guiseley, Leeds.
 Archer, Prof. T. C., Museum of Science and Art, Edinburgh.
 Archibald, Mr. G. T., 56, Low Church Street, Workington.

- Armitage, Mr. E. H., Dartford.
 Armitage, Mr. G., Broomhill, Greenock, N.B.
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 Arnold, Mr. S., Mount Ephraim, Tunbridge Wells.
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 Aslin, Mr., Address unknown.
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 Atherton, J. H., F.C.S., Nottingham.
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 Atkins, Mr. T. W., High Street, Poole, Dorset.
 Atkins, Mr. W. S., Broad Street, Birmingham.
 Atkinson, Mr. J., Tynemouth, Northumberland.
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 Austin, Mr. H. F., 126, Bermondsey Street, S.E.
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 Babbie, Mr. J., Dumbarton.
 Backhouse, Mr. H., care of Messrs. Goodall, Backhouse & Co., Leeds.
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 Bagnall, Mr. W. H., 7, New Street, Lancaster.
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 Bailey, Mr. J. B., 9, Coley Hill, Reading.
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 Bailey, Mr. T., Westbury, Wilts.
 Bailey, Mr. W., Horseley Fields Chemical Works, Wolverhampton.
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 Baker, Mr. C. P., High Street, Chelmsford.
 Baker, Mr. F., Harnit Street, Sandwich.
 Baker, Mr. F. B., 195, Queen's Road, Dalston, E.
 Baker, Mr. G., High Street, Cosham, Hants.
 Baker, Mr. P. C., Swaffham.
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 Barnitt, Mr. J., 4, Upper Parade, Leamington.
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 Barrett, Mr. T. G., Church Street, Ilchester.
 Barron, Mr. F., 1, Bush Lane, E.C.
 Barron, Mr. W., 37, Winchcomb Street, Cheltenham.
 Bartle, Mr. W., Mr. Timothy's, Castle Street, Reading.
 Barton, Mr. A., Campbelltown, Argyshire.
 Barton, Mr. A. F. G., 115, Edge Lane, Liverpool.
 Barton, Mr. H. E., Kenilworth.
 Barton, Mr. H., 77, King's Road, Brighton.
 Barton, Mr. S. W., 1, Piccadilly, Manchester.
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 Bates, Mr. W. I., Macclesfield.
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 Beal, Mr. E. J., Ilford.
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 Beardsley, Mr. J., Nottingham.
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- Beetham, Mr. M., 7, Promenade Villas, Cheltenham.
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 Bell, Mr. F., 36, Tyrrel Street, Bradford.
 Bell, Mr. F. E., Tow Law.
 Bell, Mr. F. R., Sussex Street, Middlesbore-on-Tees.
 Bell, Mr. G., Market Place, Hexham.
 Bell, Mr. J. A., Ashton, near Preston.
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 Bell, Mr. R. E., 161, East Street, Walworth, S.E.
 Bell, Mr. T., Ambleside.
 Bell, Mr. W., 14, King's Street, Yarmouth.
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 Bennett, Mr. R., 3, King Street, Sheffield.
 Bennett, Mr. S., Tunstall, North Staffs.
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 Bently, Mr. W. J., High Road, Tottenham, N.
 Bernays, Dr. A. J., F.C.S., St. Thomas's Hospital, S.E.
 Berridge, Mr. A., Cheapside, Leicester.
 Berry, Mr. E., The Cross, Gloucester.
 Berry, Mr. T., Henshaw Street, Oldham.
 Berry, Mr. W. (Messrs. Hatch, Isaac & Co.), Redland, Bristol.
 Best, T. F., F.C.S., 66, Aldersgate Street, E.C.
 Betty, Mr. S. C., 1, Park Street, Camden Town, N.W.
 Bevan, Mr. C. F., Church Street, Harwich.
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 Bindloss, Mr. G. F., 97, Leighton Road, N.W.
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 Bingley, Mr. J., Northampton.
 Binnie, Mr. R., Dumbarton, N.B.
 Birch, Mr. H. C., 7, Church Road, Upper Norwood, S.E.
 Bird, Mr. A., Wood Lane, Shepherd's Bush, W.
 Bird, Mr. W. L., 42, Castle Street East, W.
 Birkett, Mr. J., The Crescent, Morecambe, Lancs.
 Bishop, Mr. A., Specksfields, Booth Street, London, E.
 Bishop, Mr. C. E., 338, Oxford Street, W.
 Bishop, Mr. W. M., 233, High Street, Lincoln.
 Blabey, Mr. J. J., Allerton Road, Woolton, near Liverpool.
 Black, Mr. J., 76, Main Street, Rutherglen, N.B.
 Black, Mr. J., Woodside, Cambuslang, N.B.
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 Blackshaw, Mr. T., 36, Market Place, Burslem.
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- Bladon, Mr. W. G., Blackmore House, Malvern Wells.
 Blain, Mr. A. H., 341, Upper Parliament Street, Liverpool.
 Blain, Mr. W., Market Street, Bolton.
 Blair, Mr. R. P., 230, South Street, Perth.
 Blake, Mr. A., Sutton, Ensham, Oxon.
 Blanchflower, Mr. T. C., South Quay, Yarmouth.
 Bland, Mr. H., 33, Newborough Street, Scarborough.
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 Blankley, Mr. W., Arnold, Nottingham.
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 Boor, Mr. F., Fallowfield, Manchester.
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 Booth, Mr. J., 5, Darwen Street, Blackburn.
 Booth, Mr. J., Elmfield, Rochdale.
 Booth, Mr. J., Heckmondwike.
 Booth, Mr. R., Parliament Row, Hanley.
 Booth, Mr. W. G., 146, Wellington Road, Eccles.
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 Bordass, Mr. J., Driffield, Yorks.
 Borthwick, Mr. A. J., Market Place, Selkirk.
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 Bowker, Mr. W., 20, Manor Street, Bolton.
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 Bowling, Mr. J., 23, Leinster Terrace, W.
 Bowman, H., F.C.S., Chemical Works, Washington, near Newcastle-on-Tyne.
 Boyce, Mr. G., Chertsey.
 Boyce, Mr. J. P., Peaseod Street, Windsor.
 Braby, F., F.C.S., F.G.S., M.R.I., Mount Henley, Sydenham Hill, S.E.
 Bracher, Mr. E., Mere, Wiltshire.
 Braddock, Mr. H., 33, Queen's Road, Oldham.
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 Bradley, Mr. T. D., 33, Bond Street, Brighton.
 Bradshaw, Mr. J., Adlington, near Chorley, Lancashire.
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 Brady, H. B., F.R.S., 29, Mosley Street, Newcastle-on-Tyne.
 Brathwaite, Mr. J. C., 54, Kentish Town Road, N.W.
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- Bray, J., F.C.S., 71, High Street, Mile Town, Sheerness.
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 Braysbay, Mr. W. B., 38, High Street, Stockton-on-Tees.
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 Breeze, Mr. G., Devonport.
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 Bremridge, Mr. R., 17, Bloomsbury Square, W.C.
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 Brew, Mr. T. A., 71, East Street, Brighton.
 Brewster, Mr. W., 270, Regent Street, W.
 Bridgman, Mr. W. L., St. Mary Church, Torquay.
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 Brierley, Mr. R., Market Street, Stalybridge.
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 Broad, Mr. J. M., Rise House, Hornsey Rise, N.
 Brockett, Mr. R. H., 41, Northumberland Street, Newcastle-on-Tyne.
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 Brodie, Mr. R., 118, Crown Street, Glasgow.
 Brook, Mr. R., Silver Street, Halifax.
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 Brooke, Mr. T., Aire Street, Leeds.
 Brookes, Mr. F. J.
 Brooks, Mr. C., 355, Wandsworth Road, S.W.
 Broom, Mr. G., Llanelly, Carmarthenshire.
 Broughton, Mr. A., 99, Meadow Lane, Leeds.
 Brown, Mr. A. H., Shanklin, I. of W.
 Brown, Mr. A. J., 55, Trafalgar Terrace, Greenwich, S.E.
 Brown, Mr. D., 93, Abbey Hill, Edinburgh.
 Brown, Mr. E., 66, Woodhouse Lane, Leeds.
 Brown, Mr. E. W., Thrapstone, Northamptonshire.
 Brown, Mr. G., Sandown, Isle of Wight.
 Brown, Mr. G. B., 48, Church Street, Sheffield.
 Brown, Mr. H., 40, Aldersgate Street, E.C.
 Brown, Mr. J., 187, Mill Street, Great Ancoats, Manchester.
 Brown, Mr. J., Market Square, Hanley, Stoke-on-Trent.
 Brown, Mr. J. F., 4, Market Square, Dover.
 Brown, Mr. R. D., Loose Hill, Loose, near Maidstone, Kent.
 Brown, Mr. R. S., Hanover Street, Edinburgh.
 Brown, Mr. T., 110, Irongate, Glasgow.
 Brown, Mr. W. B., 100, Fishergate, Preston, Lancs.
 Brown, Mr. W. S., 113, Market Place, Manchester.
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 Buchanan, Mr. J., 52, North Bridge, Edinburgh.
 Buchanan, Dr. T. D., 24, Westminster Terrace, Glasgow.
 Buck, Mr. J. E., Haverhill, Suffolk.
 Buck, Mr. J. M., 179, Bedford Street South, Liverpool.
 Buck, Mr. R. C., 192, Breck Road, Liverpool.
 Buckle, Mr. C. F., 77, Gray's Inn Road, W.C.
 Buckley, Mr. R. C., Todmorden.
 Bulgin, Mr. W., New Road, Gravesend.
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Bullock, L., F.C.S., 3, Hanover Street, W.
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 Burdon, Mr. J., Durham.
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 Burgess, Mr. R., Winsford, Cheshire.
 Burkinshaw, Mr. W. T., Belper, Derbyshire.
 Burlinson, Mr. T., Central Hall, Sunderland.
 Burn, Mr. T., Peel Street, Bp. Wearmouth.
 Burn, Mr. D. H., High Street, Arbroath.
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 Burton, Mr. S., 10½, High Cross Street, Leicester.
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 Busby, Mr. J., Harpenden, Herts.
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 Butler, Mr. J., jun., Great Bridge, Tipton.
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 Cardwell, Mr. J., Wakefield.
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 Carter, Mr. W., Cheetham Hill, Manchester.
 Cartwright, Mr. W., Ironmarket, Newcastle-under-Lyme.
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 Caswell, Mr. E., 37, Regent Street, Leamington.
 Caunt, Mr. W. F., Buckley, Mold.
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 Smith, Mr. W., Sutton Coldfield.
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 Spencer, Mr. P., Lower Prior Street, Newcastle-on-Tyne.
 Spencer, Mr. T. Asbournby, Lincs.
 Spencer, Mr. W. H., Burnham Market, Norfolk.
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 Thomas, Mr. J. J., Garstans, Lanes.
 Thomas, Mr. M., Taffswell, Cardiff.
 Thomas, Mr. R., Burnley.
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 Thompson, Mr. G., Alston.
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 Thompson, Mr. H. A., 22, Worship Street, Finsbury Square, E.C.
 Thompson, Mr. H., Moor Street, Sunderland.
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 Turner, Mr. J., Beaumont Street, Hexham.
 Turner, Mr. J., Aylesbury.
 Turner, Mr. J. A., Whitefield Road, Liverpool.
 Turner, Mr. J. K., Cleator Moor, *via* Carnforth, Cumberland.
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 Walker, Mr. C. W., 180, Falkner Street, Liverpool.
 Walker, Mr. D. P., 125, New City Road, Glasgow.
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 White, Mr. J. W., 52, Royal York Crescent, Clifton, Bristol.
 White, Mr. L. P., Penistone, Yorks.
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 Whittaker, Mr. W., Runcorn.
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 Wilkinson, Mr. T., 270, Regent Street, W.
 Wilkinson, Mr. W., 114, Lambeth Walk, S.E.
 Wilkinson, Mr. W., Hope Street, Crook, Durham.
 Wilkinson, Mr. W., 263, Cheetham Hill, Manchester.
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 Williams, Mr. J. V., St. Alban's House, Weymouth.
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 Williams, Mr. R., Middleton, Manchester.
 Williams, Mr. R., St. Clears, Carmarthenshire.
 Williams, Mr. R., 2, Gresham Place, East Brixton, S.W.
 Williams, Mr. T., 2, Bridge Street, Aberystwith.
 Williams, Mr. T., 11, Bute Street, Cardiff.
 Williams, Mr. W., 265, Crown Street, Liverpool.
 Williams, Mr. W. H., 13, Upper Baker Street, W.
 Williams, Mr. W. J., 137, Cannon Street, E.C.
 Williams, Mr. W. P., Long Row, Nottingham.
 Williamson, Mr. T. U., Gosford Street, Coventry.
 Willis, Mr. B. W., 12, The Foregate, Worcester.
 Willmott, Mr. W., King's College Hospital, W.C.

- Willmott, Mr. W., 83, High Street, Borough, S.E.
 Wills, J. L., F.C.S., 4, Broad Sanctuary, S.W.
 Willsher, Mr. S., Brunswick House, Tenterden.
 Wilson, Mr. C. F., 22, Liverpool Road, Stoke-on-Trent.
 Wilson, Mr. E., London Road, Sheffield.
 Wilson, Mr. E. W., 44, Peploe Street, Bishopsfield, Chester.
 Wilson, Mr. G., Greenock, N.B.
 Wilson, Mr. H., 19, Rusholme Road, Manchester.
 Wilson, Mr. I., Market Place, Crook.
 Wilson, Mr. J., General Infirmary, Derby.
 Wilson, Mr. J., 35, High Street, Perth.
 Wilson, Mr. J., Penrith, Cumberland.
 Wilson, Mr. J. H., 10, West Park, Harrogate.
 Wilson, Mr. J. P., 115, London Street, Reading.
 Wilson, Mr. R., Clay Cross, Chesterfield.
 Wilson, Mr. B. M., Nefyn, Carnarvonshire.
 Wilson, Mr. T., Walsham-le-Willows, Suffolk.
 Wilson, Mr. T. W., 3, Bootham, York.
 Wilson, Mr. W., 21, High Street, Hanley, Staffordshire.
 Wiltshire, T. P., M.R.A.C., F.C.S. (Messrs. Hay, Gordon & Co.),
 Widnes, Lancashire.
 Windsor, Mr. G., East Cornwall House, Torpoint, Devonport.
 Wing, Mr. T. N., Melton Mowbray.
 Wink, Mr. J. A., 5, Barge Yard, Bucklersbury, E.C.
 Witherington, Mr. T., 7, Foregate Street, Worcester.
 Wood, Mr. A., New Brentford, Middlesex.
 Wood, Mr. B., Northgate, Halifax.
 Wood, Mr. E. B., 46, Holloway Road, Birmingham.
 Wood, Mr. J., 8, New Street, Barnsley.
 Wood, Mr. R., 25, Mill Street, Macclesfield.
 Wood, Mr. W. A., 81, Church Street, Hunslet, Leeds.
 Wood, Mr. W. H., Front Street, Arnold, Notts.
 Woodburn, Dr. J. C., 12, St. George's Road, Glasgow.
 Woodcock, Mr. J., 15, Southgates, Leicester.
 Woodcock, R. C., F.C.S., Royal Agricultural College, Cirencester.
 Woodhead, Mr. J. T., 29, Paradise Street, Liverpool.
 Woodhead, W. H., M.D., N.Y., 59, Grosvenor Street, Manchester.
 Woodland, Mr. W. F., Chard, Somersetshire.
 Woods, Mr. J., North Street, Chichester.
 Woodward, Mr. J. L., Bridgwater.
 Woolcott, Mr. C., 31, Upper Parade, Leamington.
 Woolley, Mr. H., Moulton, near Spalding.
 Woolley, Mr. H., 69, Market Street, Manchester.
 Woolley, Mr. G. S., 69, Market Street, Manchester.
 Woolley, Mr. G. B., 7, Middle Row, Maidstone.
 Woolrich, Mr. C. B., Uttoxeter, Staffs.
 Woolstencroft, J., Carnforth, N. Lancashire.
 Wooster, Mr. J. R., 4, Broadway, Turnham Green, W.
 Wootton, Mr. A. C., 44, Burghley Road, Highgate Road, N.W.
 Wootton, Mr. P., Luton, Beds.
 Worfolk, Mr. F., 57, Bridge Street, Bolton.
 Worthington, Mr. W., 2, Camden Place, Preston.
 Wovenden, Mr. H., Sale, Manchester.
 Wright, Mr. A., 109, High Street, Lowestoft.
 Wright, Mr. A., 16, Little Alie Street, E.
 Wright, C. B. A., D.Sc., F.C.S., Chemical Laboratory, St. Mary's
 Hospital, W.
 Wright, Mr. C. W., Marlbro' Lodge, Marlbro' Hill, Bristol.
 Wright, F., L.S.A., Stamford Bridge, York.
 Wright, Mr. G., Creswell Cottage, Derby Road, Burton-on-Trent.

Wright, Mr. G., 29, Congreve Street, Birmingham.
 Wright, Mr. G. H., 103, Boro' High Street, S.E.
 Wright, Mr. J. A., Market Place, Haslingden.
 Wright, Mr. J., 165, King Street, Yarmouth.
 Wright, Mr. W. F., Regent Street West, Leamington.
 Wright, Mr. W. O., 55, Great Scotland Road, Liverpool.
 Wright, Mr. W. V., 50, Southwark Street, S.E.
 Wyatt, Mr. H., 20, Derby Road, Bootle, Liverpool.
 Wyke, Mr. J., 51, Cross Street, Abergavenny.
 Wylde, Mr. G., 53, King's Road, Chelsea, S.W.
 Wyles, Mr. B., Bourne.
 Wyles, Mr. W., 8, Argyle Street, Bath.
 Wyley, Mr. J., Coventry.
 Wyley, Mr. W. F., Hertford Street, Coventry.
 Wynne, Mr. E. P., 38, Pier Street, Aberystwith.

Yarde, Mr. G., 60, Lamb's Conduit Street, W.C.
 Yardley, Mr. E., Ruabon, Denbighshire.
 Yates, Mr. F., 64, Park Street, Southwark, S.E.
 Yeats, Mr. T. F., 68, Market Street, Manchester.
 Yeomans, Mr. J., Sydney Street, Cambridge.
 Yewdall, Mr. E., Wade Lane, Leeds.
 Young, Mr. D., Cirencester.
 Young, Mr. H. T. B., 105, North Street, Leeds.
 Young, Mr. J., 16, Gallowtree Gate, Leicester.
 Young, Mr. J., 20, High Street, Newport, Mon.
 Young, Mr. J., Folds Road, Bolton.
 Young, J., M.D., 5, Howard Street, Sheffield.
 Young, Mr. J. C., Warrington.
 Young, Mr. J. R., 17, North Bridge, Edinburgh.
 Young, C., F.R.C.S.Edin., 50, Ann Street, Dundee.
 Young, Mr. R. F., New Barnet.
 Young, Mr. T., Address unknown.
 Young, Mr. W., 8, Neeld Terrace, Harrow Road, W.
 Younger, Mr. T., Brampton, Cumberland.

NOTICE.

Members will please report any inaccuracies in these lists to

PROFESSOR ATTFIELD, *Hon. Gen. Sec.*,
 17, Bloomsbury Square,
 London, W.C.

BRITISH PHARMACEUTICAL CONFERENCE.

1875-6.

ALPHABETICAL LIST OF TOWNS AT WHICH MEMBERS RESIDE.

*The names to which an asterisk is attached are those of Local Secretaries.
For Alphabetical List of Names, see page 411.*

Aberayron. Jones, J. P.	Alfreton. Neale, H. (Riddings.) Robinson, J. S.	Arundel. Price, T. U.
Aberdare. Sims, W. Thomas, W. J.	Alnwick. Hunter, H. Newbigen, J. S. Simpson, G.	Asbournby, Lincs. Spencer, T.
Aberdeen. Davidson, C. McGregor, G. (Ellon). Rattray, W. Sim, J. Strachan, A.	Alresford. Huggins, J. Law, A.	Ashby-de-la-Zouch. Cooper, A. Johnson, S. E. Matthews, F.
Aberdeen (Old). Ross, R.	Alston. Monkhouse, A. T. Thompson, G.	Ashford, Kent. Ingall, J.
Abergavenny. Wyke, J.	Alton. Stone, J. J.	Ashton-under- Lyne. Belfield, W. *Bostock, W. Fisher, E. Hirst, J. Thatcher, T. Waterhouse, J.
Abergele. Lloyd, E., jun.	Altrincham. Hughes, E. Hughes, J. T.	Atherstone. Orme, W.
Aberystwith. Davies, D. J. Davies, J. H. Vaughan, W. G. Williams, T. Wynne, E. P.	Alva (Stirlingshire). McNicol, J.	Axminster. Gunn, F. J. Pryer, W. S.
Accrington. Astin, E. Bickersdiike, W. E. (Church.) Cooper, M. (Church.)	Ambleside. Bell, T. Kirkby, R.	Aylesbury. Turner, J.
Airdrie, N.B. Harvie, J.	Anstruther. Fortune, R.	Ayr. Burns, W. Dobbie, J.
Alford, Lincs. Bryant, R. W. Shaw, C. J.	Appleby. Longrigg, J.	Bacup. Mace, J.
	Arbroath. Barn, D. H. Milne, P. Ogilvie, G. P.	Bakewell. Coates, A.
	Ardrossan. Gemmell, H.	Bampton. Gare, W.

- Banbury.**
Linnett, S. S.
Simpson, T.
(Boxham.)
- Banchory.**
Lunan, A.
- Bangor.**
Griffith, J. E.
Roberts, M.
- Barmouth.**
Williams, H.
- Barnard Castle.**
Badcock, J.
Gibson, B. W.
- Barnstaple.**
Curtis, W.
Goss, S.
Symons, W.
Tremeer, J. J.
- Barnsley.**
Ellison, J. B.
(Wombwell.)
Iberson, J.
Wood, J.
- Barrow.**
Longley, G.
Willan, R.
- Barton-on-Humber.**
Tomlinson, H. J.
- Basingstoke.**
Sapp, A.
- Bath.**
Appleby, E. J.
Barnitt, F.
Brooke, C.
Commans, R. D.
Ekin, C.
Lear, W. M.
Marsh, J. H.
Merrikin, J.
*Pooley, J. C.
Toone, J. V.
Tylee, J. P.
Walker, W.
- Bathgate.**
Frieland, J.
- Bawtry.**
Jackson, F. J.
- Beccles.**
Steel, J. W.
- Beckenham, Kent.**
Day, T. S.
- Bedale.**
Hawkin, J.
- Bedford.**
Cuthbert, J. M.
Masters, H. J.
Norman, J. S.
- Belfast.**
Davidson, F.
Haslett, J. H.
Morris, S. H.
Pring, R. W.
- Belper, Derby.**
Burkinshaw, W. T.
- Beeston.**
Faull, E.
- Berriew.**
Tilsley, J.
- Berwick-on-Tweed.**
Davidson, J.
Ward, W.
- Beverley.**
Hobson, C.
- Bewdley.**
Harradine, H. G.
Newman, R.
- Bicester.**
Sandiland, R. B.
Wilday, G. E.
- Bideford.**
Dingle, E.
Griffiths, T.
- Bilston.**
Gray, C.
Kearnes, R. H.
Lloyd, G. H.
- Bingley, Yorks.**
Perfect, R.
Skirrow, W. E.
- Birkenhead.**
Bennett, H.
Darwin, G. H.
- Dickinson, J.**
*Dutton, J.
Fawcett, J.
Foulkes, W. J.
Jones, C.
Mullock, R.
Nicholson, H.
Shaw, R. H.
Shillingland, W.
Walkden, J.
- Birmingham.**
Arblaster, C. J.
Atkins, W. S.
Barclay, T.
Bates, J.
Canning, C.
Clayton, F. C.
Foster, J. A.
Grady, F.
Greves, J. B.
Grieves, A. S.
Holdsworth, T. W.
Jones, J. A.
Kimberley, W.
Lear, G. H.
Miller, W. C.
Nock, J.
Oxborrow, E.
Palethorpe, S.
Plant, G. W.
Price, W.
Sanderson, H.
Smith, A.
Snape, E.
Southall, A.
Southall, W.
Tait, L.
Thonger, G.
Tucker, H. S.
Weaver, T.
Whittles, H.
Williams, J.
Wood, E. B.
Wright, G.
- Bishop Auckland.**
Armstrong, J.
Dobinson, T.
Harburn, R. H.
*Leigh, J. J.
Thorburn, H.
- Bishop's Castle.**
Owen, J.
- Bishop Stortford.**
Speechly, G.

- Bishop Wearmouth.**
Burn, T.
Walton, J.
- Blackburn.**
Booth, J.
*Farnworth, W.
Hall, J. J.
Moulden, W.
Openshaw, G. H.
Wells, W.
Whewell, G.
- Blackpool.**
Harrison, J.
Jackson, J.
- Blairgowrie.**
Crerar, J.
Grant, W.
- Blandford.**
Groves, W. E.
Jackson, J.
- Bodmin.**
Williams, J. D.
- Bognor.**
Long, A. T.
- Bolton, Lancashire.**
Blain, W.
Bowker, W.
Challinor, M.
Challinor, S. M.
Cunliffe, J.
Cunliffe, N.
Dutton, F.
Evans, D. O.
(Farnworth.)
Fisher, W.
Grisdale, T.
Harrison, R.
(Farnworth.)
Hart, J.
Hart, W.
*Harwood, E. G.
Heap, R.
Holmes, T.
Holstead, T.
Knott, R.
Leather, W.
Martin, R.
Morris, T.
(Farnworth.)
Moserop, T.
Pownall, T. R.
Priestley, J.
Richardson, J. V. F.
Ward, W. B.
- Watkinson, J. W.,
(Farnworth.)
Worfolk, F.
Young, J.
- Borrowstowness, N.B.**
Hughes, F. R.
- Boston.**
Fowler, W. R.
*Marshall, R.
Mells, H. (Kirtton.)
Pille, S.
Thomas, J. A.
Scruton, P. D.
- Boston Spa.**
Gill, H.
Rogerson, M
- Bourne.**
*Mills, R. M.
Roberts, J. B.
Wyles, B.
- Bournemouth.**
Mason, J.
Trim, E.
- Brackley.**
Sirett, H.
- Bradford-on-Avon.**
Saunders, T. P.
- Bradford, Yorkshire.**
Appleyard, R.
Bailey, J. T.
Baxter, W.
Beanland, S.
Bell, F.
Butterworth, A.
Cockshott, W.
Drake, W. (Wyke.)
Farnell, J.
Faull, J.
Handforth, E.
Harland, T.
Harrison, T.
Henderson, C.
Hick, J.
Holloway, W.
Jackson, J.
Jolley, J.
King, W.
Lister, S.
Metcalfe, A. A.
Newsholme, W.
Parker, W.
- *Parkinson, R.
Priestley, J.
Pallan, T.
Rhodes, S.
Rimington, F. M.
Rogerson, H. G.
Savag, J. L.
Sharp, J.
Silson, R. W.
Spencer, J.
Stead, T.
Sutcliffe, J.
Swaine, J.
Tankard, J.
Thornton, H.
Walker, J.
Watts, J.
West, W.
White, W.
- Braintree.**
Downing, J. G.
- Brampton, Cumberland.**
Younger, T.
- Brechin, N. B.**
Hodgeton, D.
- Brentford (New), Middlesex.**
Wood, A.
- Brentford (Old), Middlesex.**
Warrand, T.
- Brentwood, Essex.**
Guest, E. P.
- Bridge, Kent.**
Thomas, J.
- Bridge of Allan, N.B.**
Farie, G.
- Bridgend.**
Powell, W.
- Bridgnorth.**
Hughes, H.
- Bridgwater.**
Griffith, W. H.
Williams, G. L.
Woodward, J. L.
- Bridlington Quay.**
Dickins, J.

- Bridport.**
Beach, J.
Tucker, C.
- Brierley Hill.**
Geary, E.
Steward, J.
Westwood, A.
- Brigg.**
Nicholson, W. O.
- Brighton.**
Barton, H.
Billing, T.
Blacklock, J. D.
Bradley, T. D.
Brew, T. A.
Cornish, W.
Cox, H. E.
Dinnis, J.
Dowsett, A.
Edwards, J.
Else, W.
Ettles, J.
Field, J.
Foster, F.
Gibson, W. H.
Glaisyer, T.
Guy, F.
Gwatkin, J. T.
Haffenden, T.
Harris, E. R.
Histed, E.
Kemp, J.
Kent, G. F.
Long, H.
Merrett, —
Noakes, R.
Padwick, J.
Phillips, J.
Robson, T.
Salmon, F. W.
*Savage, W. D.
Savage, W. W.
Smith, W.
Smith, W. H.
Stevens, W. G.
Vizer, E. B.
Warneford, F.
Warren, G. R.
Watts, C. C.
- Brill.**
Holmes, F. G.
- Bristol.**
Ackerman, T.
Berry, W.
- Boorne, C.
Boucher, J.
Bush, T. (Paulton.)
Carpenter, J. T.
Cuff, R. C.
Dudden, R. M.
Fardon, H.
Glossop, G. E.
Hartland, J.
Hatch, R. M.
Jennings, T. H.
Lockyer, W. J.
Matthews, H.
Pitman, J.
Plumley, J. J.
Samson, E.
Saunders, T. C.
Sprackett, G.
Stoddart, W. W.
Stoddart, W. W. B.
Stroud, J.
Thomas, J. D. D.
Townsend, C.
Tritton, C.
Tucker, R. L. (Red-land.)
Wright, C. W.
- Briton Ferry.**
Jones, M. H.
- Broadstairs.**
Poore, E.
- Bromsgrove.**
Haines, J. J.
Taylor, W. G.
- Bromwich, West.**
*Burch, W.
Green, J.
Holliday, T.
Pershouse, E.
Roberts, G.
- Broseley.**
Stevens, J.
- Brynmaur.**
Evans, A. E.
Jones, A. M.
- Buckingham.**
Kingerlee, G.
- Buckie.**
Brenner, J.
Webster, J.
- Buckley, Mold.**
Caunt, W. F.
- Burgh-le-Marsh.**
Limon, H.
- Burnham, Lynn.**
Griffin, A. W.
- Burnham Market.**
Spencer, W. H.
- Burnley.**
Ashworth, T.
Crawshaw, E.
Hay, D. (Nelson.)
Hitchin, R.
*Thomas, R.
- Burry Port.**
Olive, W. T.
- Burton-on-Trent.**
Brierley, J.
Wright, G.
- Bury, Lancashire.**
Marsden, W. H.
Pennington, T.
- Bury St. Edmunds.**
Clifton, G. F.
Farrow, C. H.
*Floyd, J.
Hardwicke, E. J.
Jenner, C. S.
- Burslem.**
*Blackshaw, T.
Guest, G. C.
Leicester, T.
Oldham, W.
- Bushey Heath.**
Short, E. C.
- Buxton.**
Ball, E.
Barnett, A.
Hutchinson, J.
Sykes, E. J.
- Caistor, Lincolnshire.**
Levick, G. A.
- Callington.**
Dawe, J.
- Cambridge.**
Church, H. J.
Crampton, J.
*Deck, A.
Groves, A.
Hobbs, D.
Smith, T.
Sussum, F.
Yeomans, J.

- Campbeltown.**
 Barton, A.
- Cambuslang.**
 Black, J.
 Clark, S. P.
- Canterbury.**
 Amos, D.
 Bing, E.
 *Harvey, S.
- Cardiff.**
 Collier, J. A.
 John, W. D.
 Jones, J. T.
 Joy, F. W.
 Proctor, R. (Penarth.)
 Reynolds, T. (Caer-
 philly.)
 Thomas, M.
 Williams, T.
- Carlisle.**
 Daniel, J.
 Fisher, J. J.
 Foster, J.
 Gibson, C.
 Graham, J.
 Hallaway, J.
 Pattinson, J. S.
 Pattinson, R. J.
 Sowerby, J.
 Richardson, T. J.
 Robson, J.
 *Thompson, A.
 Todd, J.
 Walker, J. D.
- Carmarthen.**
 Jones, E. B.
 Rees, D.
- Carnforth.**
 Woolstencroft, J.
- Carnoustie.**
 Nicol, W.
- Castleford.**
 Farrer, C.
- Cerrig-y-druidion.**
 Williams, E.
- Chapel Allerton.**
 Entwistle, J.
- Chapeltown.**
 Gibson, J.
- Chard.**
 Churchouse, W. J. F.
 Woodland, W. F.
- Chatham.**
 Lamb, T. C.
 Marks, B.
 Rossiter, J.
- Chatteris.**
 Langman, P.
- Chelmsford.**
 Baker, C. P.
 Metcalfe, W.
- Cheltenham.**
 Balcomb, J.
 *Barron, W.
 Beetham, M.
 Butcher, T.
 Crawford, S.
 Fletcher, J.
 Forth, W.
 Horsley, J.
 Jeffrey, T. A.
 Smith, N.
 Toone, J. A.
- Chertsey.**
 Boyce, G.
- Chester.**
 Blelock, C. J.
 Baxter, G.
 Grindley, W.
 Higgins, W.
 Hodges, W.
 Jones, R.
 Marcham, J.
 Mills, J.
 Roberts, R. M.
 *Shepherd, T.
 Williams, J. E.
 Wilson, E. W.
- Chesterfield.**
 Wilson, R.
- Chester-le-Street.**
 Coxon, R. J.
 Greenwell, R. H.
 Longbotham, J.
 *Robinson, Joseph
 (Stanley.)
- Chichester.**
 Woods, J.
- Chipping Ongar.**
 Chapman, R. J.
- Chipping Sodbury.**
 Wheeler J.
- Chislehurst.**
 Beaumont, C. F. J. B.
- Chorley.**
 Bradshaw, J.
 (Adlington.)
 Lister, J.
 Moss, J.
 Oakes, G.
- Chudleigh.**
 Cleave, W.
- Church Stretton,**
 Salop.
 Phillips, J.
- Cinderford, Glou-**
cestershire.
 Cordwin, W.
- Cirencester.**
 Church, A. H.
 Mason, J. W.
 Smith, C. S.
 Young, D.
- Clayton-le-Moors.**
 Johnson, M.
- Cleator Moor.**
 Turner, J. K.
- Cleobury-Morti-**
mer.
 Evans, E. P.
- Clevedon.**
 Chapman, H.
- Clifton, Bristol.**
 Barker, C. D.
 Cooper, J. N.
 Driver, A.
 Mortimer, J.
 *Schacht, G. F. •
 Tilden, W. A.
 Towerzey, A.
 Troake, R. J.
 Warner, G. T.
 White, J. W.
- Clitheroe.**
 Hargreaves, R
- Clun, Salop.**
 Darroll, W.
- Coalville.**
 Porter, J.
- Cockermouth.**
 Cooper, W. J.
 Robinson, W.

- Codnor.
Farnsworth, T.
- Colchester.
Cole, F. A.
Hammerton, E.
*Prosser, E. T.
Shenstone, J. B. B.
Shenstone, W. A.
- Coldstream, N. B.
Dodds, N.
- Coleford.
Cheese, H.
- Collumpton.
Foster, J.
- Colne, Lancashire.
Asquith, W. C.
- Colinsburgh, N.B.
Todd, T.
- Coltishall, Norfolk.
Smith, W. L.
- Connah's Quay.
Jones, K. L.
- Consett.
Imrie, D.
- Conway.
Edwards, J.
- Cork.
Bannister, W.
Carnegie, W.
Churchill, H.
Cooke, J.
Harrington, W.
Jennings, F. M.
Selkirk, J.
Wheeler, A. A.
- Cosham.
Baker, G.
- Coventry.
Alcock, H.
Astley, J.
Glover, H.
Hands, R. M.
Hinds, J.
Hinds, W.
Hiscock, R.
Hodgkinson, G.
*Powers, E.
Tod, J.
- Welton, H.
Williamson, T. U.
Wyley, J.
Wyley, W. F.
- Cranbrook.
Smith, J. W.
- Crawley.
Leach, J.
- Crediton.
Jackson, W.
- Crewes.
Gray, J. T.
Kay, J.
Place, W. B.
- Crewkerne.
Greaves, J.
Harris, M. C. J.
Pearce, J.
- Crieff.
Harley, J.
McGregor, D.
- Cromarty.
Johnstone, W.
- Crook.
Ditchburn, P.
Wilson, J.
Wilkinson, W.
- Crowle.
Pickering, J.
Tebb, J.
- Croydon.
Clarke, A. H.
Long, H.
Stannard, F. J.
- Cullen.
Kemp, J.
- Darlington.
Barlow, S.
Robinson, A. F.
Robinson, J.
*Swenden, J.
- Dartford.
Armitage, E. H.
Horrell, A. E.
- Dartmouth.
Rees, W. H.
- Darwen, Lancs.
Shorrock, R.
- Dawlish.
Cutcliffe, G. J.
West, E. R.
- Deal.
Clarabut, J.
McDiarmid, J. B.
- Dedham, Essex.
Kirkman, C. J.
- Denny.
Anderson, E. H.
- Derby.
Barnes, B.
Bloor, J.
Clifton, F.
Evans, B.
*Frost, G.
Medley, W.
Stevenson, R.
Wilson, J.
- Devonport.
Breeze, G.
*Codd, F.
Gardner, J. R.
Johns, T. J. R.
Newton, T. A. C.
(Stoke.)
Windsor, G. (Tor-
point.)
- Dewsbury.
Foster, A.
Fox, G.
Robinson, J. R.
- Diss.
Amyot, T. E.
Cupiss, F.
*Gostling, T. P.
Gostling, W. A.
Hayhoe, W.
Nicholson, D. G.
Thrower, E. A.
Whitrod, H. F.
- Dolgelly.
Roberts, J. C.
- Doncaster.
Hasselby, T. J.
*Howorth, J.
Parkin, C.
Shaw, H. W.
- Dorchester.
Durden, H.
How, W.

- Dorking.**
Clift, J.
- Dover.**
Adams, R. W.
*Bottle, A.
Bolton, J.
Brown, J. F.
Cotterell, W. H.
Forster, R. H.
Hambrook, J. B.
Peake, H.
- Driffield.**
Bordass, J.
Elgey, J.
Parkinson, T.
Ross, L. B.
Sterriker, J.
- Droitwich.**
Taylor, E.
- Dublin.**
Allen, C. A.
Draper, H. N.
Evans, J.
Frazer, W.
Galwey, R. J.
Goodwin, J.
Hamilton, J. T.
Hayes, W.
Hoffe, P.
Holmes, J. T.
Purefoy, R. D.
Simpson, R.
*Tichborne, C. R. C.
- Dudley.**
Dawson, J.
*Dennison, M.
Dunn, E.
Fletcher, J.
Gare, C. H.
Hollier, E.
Thompson, J. W.
(Sedgley.)
Voce, W. G. (Nether-
ton.)
- Dufftown.**
Proctor, A. D.
- Dukinfield.**
Avison, J.
- Dulverton.**
Ocock, C.
- Dumbarton.**
Babbie, J.
Binnie, R.
- Duncanstone.**
Ceraig, G.
- Dundee.**
Anderson, A. B.
Esplin, A.
Hardie, J.
*Hodge, J.
Kerr, C.
Laird, W.
Mason, J. B.
Miller, T. S.
Park, W.
Parker, F. C.
Russell, J.
Young, C.
- Dunfermline.**
Seath, A.
Stiell, G.
- Dunkeld.**
McDonald, K.
- Dunse, N. B.**
Gunn, W.
- Durham.**
*Burdon, J.
Ferrero, A. P.
Hunter, F. N.
Lambert, J.
Leighton, J. H.
Potts, J.
Sarsfield, W.
- Ealing, Middlesex.**
Cook, R.
Hayles, B. H.
- Earlestown.**
Peake, A.
- Easingwold.**
Rookledge, J.
- Eastbourne.**
Hall, S.
- East Dereham.**
Abram, F. W.
Strangroom, F.
(Cley.)
- East Grinstead.**
Tully, J., senr.
- East Retford.**
Appleby, C.
Fletcher, F. B.
W. Ibury, G.
- Eastwood.**
Ault, J.
Chambers, J.
- Eccles.**
Booth, W. G.
- Edinburgh.**
Ainslie, W.
Aitken, J.
Aitken, W.
Allan, W.
Anderson, J.
Anderson, W.
Archer, T. C.
Baildon, H. C.
Blanshard, G.
Brown, D.
Brown, R. S.
Buchanan, G.
Fairgrieve, T.
Field, A. W.
Gardner, J.
Gilmour, W.
Hill, W. G.
Howie, W. L.
Laird, G. H.
Linton, R.
Macadam, S.
Macfarlane, A. Y.
McGlashan, D.
*Mackay, J.
Mackenzie, J.
MacLagan, D.
McIntyre, E. (junr.)
Meldrum, E. D.
Moinet, F. W.
Morrison, D.
Napier, A.
Niven, W.
Noble, A.
Pinkerton, W.
Purves, S.
Raines, R.
Ritchie, J.
Robertson, J.
Sang, E.
Simpson, J.
Smiles, J.
Smith, A. W. P.
Smith, P. S.
Smith, T.
Stephenson, F.
Tait, W.
Taylor, A.
Walley, T.
Young, J. R.

- Egremont, Che-
 shire.
 Howorth, G. B.
- Elgin.
 Robertson, W.
- Ely.
 Lincoln, N.
- Emsworth.
 Waters, H. G.
- Esher.
 Ling, E.
- Exeter.
 Butland, C.
 Collett, C. B.
 Cooper, G.
 Delves, G.
 Gadd, H.
 *Husband, M.
 Longman, J. H.
 Napier, G. L.
 Pasmore, G.
 Pole, S. R.
 Stone, F. W.
 Walton, R.
- Exmouth.
 Teed, D.
 Thornton, S.
- Eyam.
 Froggatt, T. W.
- Eye.
 Nurse, W. S.
- Falkirk.
 Murdoch, D.
- Falmouth.
 Newman, W. F.
- Fareham.
 Batchelor, C.
 Franklin, A.
- Farnham.
 Higgins, W.
- Faversham.
 Lenfestey, W. G.
 Welborne, G.
 (Boughton.)
- Ferryhill.
 Smith, R.
- Flint.
 Jones, M.
- Folkestone.
 Goodliffe, G.
 Lea, J.
 Stainer, J.
- Forebridge, Staf-
 ford.
 Spilsbury, J.
- Forfar.
 Anderson, D. S.
- Forres.
 Michie, J.
- Foulsham, Norfolk.
 Newport, W.
- Frizington.
 Atlatt, F. T.
- Frodsham.
 Robinson, J. F.
- Gainsborough.
 Howlett, W. H.
- Garstans.
 Thomas, J. J.
- Gateshead.
 Elliott, R.
 Mayfield, J. T.
- Glasgow.
 Adam, T.
 Black, J.
 Brodie, R.
 Brown, T.
 Buchanan, T. D.
 Clarke, J. A.
 Cowan, —
 Currie, J.
 Currie, J.
 Davison, T.
 Dickie, J.
 Dun, R. T.
 Fairlie, J. M.
 Frazer, D.
 Fenwick, J.
 Forrest, R. W.
 Greig, W.
 Guthrie, P.
 Halley, A.
 Harrower, P.
 Hunter, J. C.
 Jaap, J.
 Johnson, A. E.
 Kennedy, W.
 *Kinninmont, A.
 Lindsay, T.
- Lockhart, J.
 McKenzie, W.
 McDonald, H. S.
 McDonald, J.
 McLeod, T.
 M'Gregor, A.
 M'Millan, J.
 Muir, G.
 Murdoch, G.
 Nicol, J.
 Pinkerton, J. S.
 Semple, J.
 Tennent, S. P.
 Townshend, R.
 Walker, D. P.
 White, J.
 Whyte, W.
 Woodburn, J. C.
- Gloucester.
 Beach, T. C.
 Berry, E.
 Cook, T.
 Hume, J. W. D.
 Meadows, H.
 Pearce, T.
 Skinner, T.
 Ward, J.
- Goole.
 Roulston, B. W.
 Squire, W.
- Gorleston,
 Gt. Yarmouth.
 Thurlby, G.
- Gosforth.
 Gaitskill, J.
- Gosport.
 Mumby, C.
- Gourock.
 Barr, R.
 Peters, J.
- Grantham.
 Cooper, H. G.
 Fisher, F. D.
 Gamble, R.
 Hall, T.
 *Hopkinson, T.
 Newcome, J.
 Rogers, W. S.
 Welborn, G.
 Whysall, W.
- Gravesend.
 Bulgin, W.
 Drury, G. S.
 Smith, G. M.

- Grays, Essex,
Soole, J. H.
- Great Bedwin.
Gerard, G. R.
- Great Malvern.
Burrow, W. B.
Francis, G.
- Great Yarmouth.
Bell, W.
Blanchflower, J.
Lee J.
Owles, J. J.
Silvers, R.
Skoulding, G. S. F.
Walpole, W.
Wright, J.
- Greenock.
Armitage, G.
Cowan, W. M.
Duncan, S.
Fisher, T.
M Naught, A.
Wilson, G.
- Grimsby.
Clayton, D. T.
Colton, T.
Cook, R.
Gossop, G. K.
Watmough, H.
- Guernsey.
Anderson, H. D.
- Guildford.
Busby, H. H.
Jeffries, H.
Vennall, G. (Cranleigh).
- Guisborough.
Bancks, A.
- Hadfield.
Jones, J.
- Halifax.
Brierley, J. B.
Brook, R.
Dyer, W.
Farr, J.
*Hebden, W. C.
Illingworth, W. H.
Jessop, J.
Pedley, T. (Triangle.)
Wood, B.
- Hamilton.
Mackill, R. C.
Scott, W.
Stewart, J.
- Hanley, Stafford.
Booth, R.
Furnival, J. D.
*Jones, C.
Lloyd, J.
Tirrell, J.
Wilson, W.
- Harleston.
Muskett, J.
- Harpenden.
Busby, J.
- Harrogate.
Allanson, C.
Bascombe, F.
*Coupland, J.
Davis, R. H.
Taylor, J. H.
Wilson, J. H.
- Hartlepool.
Warwick, D. H.
- Harwich.
Bevan, C. F.
Harding, J.
- Haslingden.
Wright, J. A.
- Hastings and St.
Leonards-on-Sea.
Branson, F. W.
Gare, J.
Kernot, G. C.
Keyworth, G. A.
*Robinson, J. S.
Rossiter, F.
Snowdon, R.
Todd, R. P.
- Havant.
Chignell, A.
- Haverhill.
Buck, J. E.
- Haverfordwest.
Saunders, D. P.
- Hay.
Davies, J. L.
- Headingley, Leeds.
Rowling, S.
- Hebden Bridge.
Hey, D.
- Heckmondwike.
Booth, J.
Stephenson, J. N.
- Helenburgh.
Finlay, J.
Harvie, G.
- Helmsdale.
Paterson, J.
- Helmsley.
Read, W.
- Helston.
Troake, M. H.
Wakeham, C.
- Henley-on-Thames.
Kinch, C. J.
- Hereford.
McCormick, F. H.
- Hertford.
Durrant, G. R.
- Hexham.
Bell, G.
Riddle, W. R.
*Smith, J. S. T. W.
Turner, J.
- Heywood.
Jackson, J.
- Hinckley.
Gilbert, G.
Pridmore, W.
- Hindley.
Slingsby, C. S.
- Hirwain.
George, J. E.
Sims, J.
- Hitchin.
Ransom, W.
- Honiton.
Lee, W.
Turner, G.
- Horncastle.
Carlton, W. P.
- Horsham.
Williams, P.

- Houghton-le-Spring.**
 Hedley, J.
 Rowell, R. H.
- Howden, York-shire.**
 Saville, J.
- Huddersfield.**
 *Chrispin, W.
 Cuthbert, R.
 Kaye, H.
 King, W.
 Swift, T. N.
- Hull.**
 Allison, E.
 Anholm, A.
 Baynes, J.
 *Bell, C. B.
 Benson, Mr. J. L.
 Clarke, I.
 Dixon, J.
 Earle, F.
 Grindall, W.
 Hall, H. R. F.
 Hammond, C. T.
 Lowther, M. K.
 Metcalfe, C. L.
 Milner, J. G.
 Myers, G.
 Peck, F. A.
 Pickering, A.
 Smith, T. J.
 Scutter, J. S.
 Staning, W.
 Stoakes, B. M.
- Hungerford, Berks.**
 Taylor, W. G.
- Huntingdon.**
 Provost, J. P.
- Hyde, Cheshire.**
 McClean, J.
 Wild, J.
- Hythe.**
 Lemmon, R.
- Idle, Yorks.**
 Hopton, E.
- Ilchester.**
 Barrett, T. G.
- Ilford.**
 Beal, E. J.
- Ilkeston.**
 Merry, W.
 Potts, R. S.
- Inverary.**
 Rodger, J.
- Invergordon.**
 Sinclair, R.
- Inverness.**
 Fraser, J.
- Ipswich.**
 Callaway, L.
 Cornell, W.
 Grimwade, E.
 Marchant, C. F.
 Sayer, E. C.
 *Wiggin, J.
- Ironbridge.**
 Hartshorn, A. F.
- Ironville.**
 Greaves, A.
 Greaves, W. S.
- Irvine.**
 Gillespie, J.
- Isleham.**
 Diver, B.
- Isle of Man.**
 Brearey, W. A. (Douglas.)
 Carran, T. (Peel.)
- Ixworth.**
 Thurlow, H.
- Jarrow-on-Tyne.**
 Rose, J. D.
 Watson, R. T.
- Jedburgh.**
 Peters, J. F.
- Jersey.**
 Ereant, G.
 Le Feuvre, F.
- Kelso.**
 Dodds, G. F.
- Keelby, near Ulceby.**
 Skinner, M. H.
- Kendal.**
 Bateson, T.
 Coulter, G.
 (Sedbergh.)
 Hind, T. W. L.
 Mangnall, W.
 *Severs, J.
- Kenilworth.**
 Barton, H. E.
- Keswick.**
 Henderson, M. J.
- Kettering.**
 Hitchman, H.
- Kidderminster.**
 Hewitt, G.
- Kidsgrove.**
 Griffiths, E. H.
- Kidwelly.**
 Glencrose, W.
- Kilmarnock.**
 Borland, J.
- Kingsbridge, Devon.**
 Troake, W. H.
- King's Lynn, see Lynn.**
- Kingston-on-Thames.**
 Tamplin, E. C.
- Kingstown.**
 Bennett, H.
- Kington, Hereford.**
 Stanway, W. H.
- Kirkby Lonsdale.**
 Haythornthwaite, W.
- Kirkcaldy.**
 Coutts, A. (Path-head.)
 Gorrie, A.
 Macknight, S. W.
 Storrar, D.
- Kirkham.**
 Blackhurst, W. S.
- Kirkintilloch.**
 Morton, T.

- Kirriemuir.**
 Ford, J.
- Kirktown St. Fergus.**
 Park, J.
- Knaresboro.**
 Sindall, J. W.
 Thompson, J.
- Lanark, N. B.**
 Cassels, T.
- Lancaster.**
 Allbright, J.
 *Bagnall, W. H.
 Battersby, S.
 Cardwell, E.
 Clark, E.
 Hall, W.
 Johnson, C.
 Vince, J.
 Wearing, W.
- Landport.**
 Ball, W.
 Hackman, L. L.
 Stanswood, J.
- Langharne.**
 David, S. S.
- Langholm.**
 Graham, W. B.
- Launceston.**
 Eyre, J. S.
- Leamington.**
 Barnitt, J.
 Bollans, E.
 Caswell, E.
 Cutting, J.
 Davis, H.
 *Jones, S. U.
 Morris, T. H. V.
 Pullin, W. H.
 Smith, S. A.
 Uppleby, H.
 Woolcott, C.
 Wright, W. F.
- Lechlade, Gloucestershire.**
 Archer, J.
- Ledbury, Hereford.**
 Freeman, T. W.
- Leeds.**
 Abbott, J.
 Archer, J. S.
- Backhouse, H.
 Barraclough, T.
 Brooke, T.
 Broughton, A.
 Brown, E.
 Clapham, J.
 Clapham, J. W.
 Cragg, J.
 Day, J.
 Dunn, H.
 Ebdell, J. T.
 Exley, G.
 Fawthorp, J.
 Ferguson, W. K.
 Greasley, M. F.
 Hardcastle, T. P.
 Hardman, W.
 Hill, F.
 Holmes, J.
 Horsfield, J. N.
 Iredale, G.
 Iredale, T.
 Jefferson, P.
 Longley, J. W.
 Manfield, W.
 Patchett, I.
 Pierson, C.
 Place, W. T.
 Pocklington, H.
 Powell, W.
 Reynolds, F.
 *Reynolds, R.
 Rhodes, W. H.
 Saxton, J.
 Smeeton, W.
 Stead, T. B.
 Steele, E. B.
 Tate, J. L.
 Taylor, B.
 Taylor, S.
 Tomlinson, W. F.
 Ward, G.
 Watson, J.
 Wildsmith, E.
 Wood, W. A.
 (Hunslet.)
 Yewdall, E.
 Young, H. T. B.
- Leek, Staffordshire.**
 Johnson, W.
- Leicester.**
 Berridge A.
 Burrows, H. C.
 Burton, S.
 Butler, E. H.
 Carr, W.
 Clark, J. W.
 Cooper, T.
- Harvey, W. R.
 Lloyd, T. H.
 Meadows, J.
 Nettleship, H.
 *Richardson, J. G. F.
 Salisbury, W. B.
 Toone, J. H.
 Wand, S.
 Wilkes, J. S.
 Woodcock, J.
 Young, J.
- Leigh.**
 Whittle, S.
- Leighton Buzzard.**
 Herington, J.
 Richmond, R.
- Leiston, Suffolk.**
 Gooch, T. P.
- Leith.**
 Finlayson, T.
- Leominster.**
 Davis, D. F.
 Owen, S.
- Leven.**
 Gibson, A.
- Levenshulme.**
 Botham, G.
- Lewes.**
 Curtis, H.
 Martin, T.
 Saxby, H., junr.
- Leyburn.**
 Campbell, G.
- Lincoln.**
 Bishop, W. M.
 *Hayward, C. J.
 Maltby, J.
- Little Bolton.**
See BOLTON.
- Liverpool.**
 *Abraham, J.
 Agnew, J.
 Albright, A.
 Alexander, J.
 Ball, G.
 Barber, G.
 Barton, A. F. G.
 Bathgate, W. L.
 Billington, F.

- Blabey, J. J.
 (Woolton.)
 Blain, A. H.
 Blood, C.
 Buck, J. M.
 Buck, R. C.
 Chelley, W. D.
 Cohen, N. S.
 Cook, E. A.
 Cross, W.
 Davies, E.
 Delf, F. T.
 Dickins, B.
 Drew, S. K.
 Driver, T. (Woolton.)
 Evans, E.
 Evans, E., junr.
 Evans, J. J.
 Evans, J. R.
 Evans, R.
 Evans, W.
 Ferguson, J.
 Flint, J.
 Fraser, A.
 Furniss, T.
 Greenall, A.
 Hall, J.
 Hallawell, J.
 Heidfield, O.
 Hingston, A. H.
 Hocken, J.
 Holt, S.
 Horton, A. T.
 Hughes, R.
 Humphries, C.
 Hunt, T.
 Johnson, J. H.
 Johnson, M. (Huy-
 ton.)
 Jones, F.
 Jones, W.
 Knowles, R.
 Lake, W. P.
 Lee, S. W.
 Lewis, R.
 Livsey, A. E.
 Lloyd, J. W.
 Lumby, A.
 MacGrath, W. H.
 Marson, B. B.
 Martin, J.
 Martin, T.
 Mason, A. H.
 McVitie, T.
 Monkhouse, J.
 Parkinson, R.
 Penketh, J.
 Redford, A.
 Redford, G. A.
 Robinson, H.
- Robinson, J. F.
 Samuel, A. H.
 Sergeant, T. W.
 Shaw, J.
 Smyth, T.
 Stedman, H. B.
 Sumner, R.
 Sumner, R. M.
 Symes, C.
 Tanner, A. E.
 Tanner, B.
 Taylor, C.
 Taylor, F.
 Troughton, C.
 Turner, J. A.
 Walker, C. W.
 Williams, W.
 Woodhead, J. T.
 Wright, W. O.
 Wyatt, H.
- Llandilo.
 Hughes, T.
- Llandudno.
 Penny, W. S.
- Llanegryn.
 Pugh, H.
- Llangollen.
 Jones, H.
- Llanwrst.
 Jones, J.
- Llanelly.
 Broom, G.
 Hughes, E.
- Llangefni.
 Hughes, R.
- Loddon.
 Ellis, T. W.
- London, E.
 Allen, W. H.
 Arnold, G. J.
 Baker, F. B.
 Banfield, H. W.
 Batting, T. G.
 Bibbings, J. H.
 Bishop, A.
 Burton, J.
 Clark, J. A.
 Dean, S.
 Dixon, J. B.
 Eastman, J. E.
 Edwards, E.
 Fitch, R. O.
- Fox, A. W.
 Fox, W.
 Frost, W. T.
 Gladding, W. B.
 Glassford, J. McL.
 Goodchild, R. S.
 Goodwin, J.
 Granger, E.
 Hall, T. H.
 Hatfield, G. T.
 Hills, H. W.
 Holford, T. C.
 Howard, D.
 Howard, W. D.
 Kernot, G. C.
 Kirk, S.
 Loane, J.
 Nicholls, T.
 Owen, R. J.
 Parrot, J.
 Rayson, H.
 Ringrose, G.
 Rogers, W.
 Skipper, E.
 Stoke, A.
 Telfer, H. V.
 Thorp, W., junr.
 Tyrer, P.
 Walker, C.
 Wilkinson, B. J.
 Wright, A.
- London, E. C.
 Attwood, A.
 Barron, F.
 Beedzler, J.
 Best, T. F.
 Brown, H.
 Chapman, F.
 Charity, W.
 Cocksedge, H. B.
 Colclough, W.
 Constance, E.
 Crispe, J.
 Cutforth, J. D.
 Darby, S.
 Davison, A.
 Evans, H. S.
 Farries, T.
 Fentiman, A.
 Flux, W.
 Foster, M. E.
 Francis, G. B.
 Francis, G. B., junr.
 Francis, W. H.
 From, W. H.
 Gadd, H.
 Gedge, W. S.
 Gething, W. B.
 Good, T.

Grimwade, E. W.
 Hampson, R.
 Hanbury, C.
 Hanbury, F. J.
 Harvey, E.
 Hawkins, T.
 Heathfield, W. E.
 Herrington, H.
 Hewlett, C. J.
 Hill, A. B.
 Hillier, H.
 Hindsley, H.
 Hodgkinson, C.
 Hodgkinson, W.
 Hooper, B.
 Hopkin, W. K.
 Horner, E.
 Horner, E., junr.
 Horner, J. T.
 Howden, R.
 Hughes, L. S.
 Hugill, J.
 Huskisson, H. O.
 Jones, J. H.
 Knight, J.
 Langdale, E. F.
 Leath, J.
 Lescher, F. H.
 Linay, T.
 Luke, R. S.
 Mackey, J. B.
 Marston, J. T.
 Maw, C.
 Owen, O. D.
 Pattison, G.
 Pedler, G.
 Penrose, A. P.
 Pond, G. P.
 Preston, J. C.
 Rossiter, W.
 Schacht, W.
 Selleck, E.
 Sharman, W.
 Simmonds, P. L.
 Smith, J.
 Squire, A.
 Squire, W.
 Stewart, A. Y.
 Stiles, M. H.
 Strawson, G. F.
 Taylor, T. C.
 Thompson, H. A.
 Thompson, J.
 Tidman, W.
 Umney, C.
 Vicary, R.
 Warner, C. H.
 Watson, T. D.
 Watts, W. M.
 Webb, E. A.

Williams, J.
 Williams, W. J.
 Wink, J. A.

London, N.

Applegate, E.
 Arundel, M. H.
 Ball, G.
 Bently, W. J.
 Boor, G.
 Brattley, F.
 Bray, C.
 Broad, J.
 Broad, J. M.
 Clapp, E. F.
 Colchester, W. M.,
 junr.
 Cruse, J. C.
 D'Aubney, T.
 Dutchman, W.
 Edwards, —
 Field, J. J.
 Garner, T.
 Handley, C.
 Harris, W. W.
 Heap, E.
 Hodson, T. W. F.
 Jefferson, T.
 Large, J. H.
 Little, H.
 Lorimer, J.
 Marshall, A.
 Mason, H. C.
 Morris, G. E.
 New, W. W.
 Owen, J.
 Parkes, J. P.
 Reboul, A. P.
 Skipper, E.
 Stable, R. H.
 Steel, F. W.
 Stevens, P. A.
 Tench, R.
 Tipping, T. J. W.
 Trick, W. B.
 Troke, C.
 Warrell, E.
 Whincup, W.
 Young, R. F.

London, N.W.

Allchin, A.
 Barret, E. L.
 Bathe, R. S.
 Bell, W. H.
 Betty, S. C.
 Biddiscombe, C.
 Bindloss, G.

Braithwaite, J. C.
 Cottrill, J. W.
 Crawley, H.
 Dunmore, G. H.
 Eve, C.
 Eminson, J. M. O.
 Glazier, W. H.
 Goldfinch, G.
 Greenish, T.
 Greenish, T. E.
 Henty, H. M.
 Johnson, J.
 Merrell, J.
 Newey, J. T.
 Pettinger, E.
 Rhind, W. W.
 Sangster, A.
 Souter, J. C.
 Stamp, E. B.
 Stansfield, R.
 Stevenson, T.
 Taplin, W. G.
 Taylor, G. S.
 Tibbs, F.
 Tuson, R. V.
 Vidler, W. T.
 Wells, T.
 While, W. J.
 Wills, J. L.
 Wootton, A. C.

London, S.E.

Atkinson, L.
 Austin, H. F.
 Baldock, J. H.
 Balls, G.
 Bateman, T. H.
 Bell, R. E.
 Bernays, A. J.
 Biddiscombe, C.
 Biffin, T.
 Birch, H. C.
 Braby, F.
 Brown, A. J.
 Childs, W.
 Clift, E.
 Coldwell, D. B.
 Collins, J.
 Cole, A. C.
 Coles, J. W.
 Congreve, G. T.
 Crisp, F. A.
 Crow, E. L.
 Dale, S.
 Dodd, W.
 Dodwell, J.
 Doughty, M.
 Earland, W.
 Elliott, J. D.
 Flood, W. W.

Forsyth, A.
 Freeman, R.
 Frost, W. T.
 Gadd, R.
 Green, S.
 Grisbrook, S.
 Hadingham, J. W.
 Hall, W.
 Hogg, J.
 Holloway, T. H.
 Howell, M.
 Izod, J.
 Jones, T.
 Laing, J. S.
 Lavers, T. H.
 Linford, J. S.
 Lockyer, G.
 Marriott, T. E.
 Miller, C. B.
 Orpe, T. M.
 Page, J.
 Pidd, A. H.
 Plummer, E.
 Poingdestre, C. R.
 Rabson, H.
 Robertson, F. F. L.
 Rossiter, W.
 Sandy, F. W.
 Sargent, D. W.
 Silverlock, H.
 Silvers, F. T.
 Simpson, T.
 Smith, J. B.
 Smith, W. F.
 Stacy, F.
 Strickett, J.
 Taylor, T.
 Thompson, H.
 Tibbs, F.
 Townsend, C.
 Truman, F. W.
 Tyrer, P.
 Wade, W.
 Wastie, F. W.
 Watling, A.
 Wiggins, H.
 Wilkinson, W.
 Willmott, W.
 Wright, G. H.
 Wright, W. V.
 Yates, F.

London, S.W.

Amoore, A. S.
 Ashton, W.
 Baily, J.
 Barnes, J. B.
 Bicknell, W.
 Bourdas, I.
 Bourdas, I., junr.

Brooks, C.
 Brownen, G.
 Burt, G. E.
 Church, J.
 Churchill, H.
 Clifford, T. A.
 Coles, F.
 Cooke, P.
 Cooper, A.
 Cox, H.
 Cromwell, O.
 Curtis, T.
 Deane, J.
 Deering, A.
 Drane, W.
 Dyer, A. J.
 Evans, E.
 Farmer, J.
 Fenn, J. W. T.
 Garty, F. B.
 Gulliver, W.
 Hall, F.
 Hanbury, D. B.
 Heath, E. A.
 Hickey, E. L.
 Hilder, R. T.
 Hucklebridge, J. M.
 Hunt, C.
 Ingham, J.
 Ive, W.
 Jones, H. S.
 Kinch, E.
 Kingzett, C. T.
 Lake, R.
 Luff, R.
 May, J.
 Newby, R. J.
 Palmer, P. L.
 Palmer, R.
 Pasmore, F. R.
 Pass, H.
 Perry, G. E.
 Pond, B. C.
 Probyn, C.
 Roach, P.
 Rowe, R.
 Schweitzer, J.
 Simpson, J.
 Smith, J. S.
 Sparrow, W. C. F.
 Staples, C.
 Sutcliffe, J.
 Swire, G.
 Swire, S.
 Thompson, R. E.
 Tippet, B. M.
 Tupholme, E. H.
 Tupholme, J. T.
 Turton, R. C.
 Urwick, W. W.

Wade, J.
 Walker, B. W.
 Wheeler, J. W.
 Williams, R.
 Wylde, G.

London, W.

Adlington, W. B.
 Aitken, R.
 Andrews, F.
 Backhouse, H. N.
 Barker, W. R.
 Barnard, J.
 Bird, A.
 Bird, W. L.
 Bishop, C. E.
 Blades, F.
 Bowles, W. J.
 Bowling, J.
 Brewster, W.
 Brightmore, W.
 Bullen, T.
 Bullock, L.
 Burden, E.
 Butt, E. N.
 Cann, C. J.
 Carteighe, M.
 Cawdell, G.
 Clark, A. H.
 Cosway, E. C.
 Coverley, E. C.
 Cracknell, C.
 Croyden, C.
 Cryer, H.
 Cullen, R. H.
 Curtis, F.
 Curtis, R.
 Dyson, W. B.
 Faulkner, J. R.
 Fincham, R.
 Flower, J. J.
 Fowler, S.
 Frankland, E.
 Gale, S.
 Gamble, H. A.
 Garner, J.
 Gaubert, S.
 Gunn, D.
 Hamilton, J.
 Hardy, S. C.
 Haselden, A. F.
 Haynes, C. H.
 Hemingway, A.
 Hemingway, E.
 Hemingway, W.
 Heywood, J. S. C.
 Hickman, W.
 Hills, T. H.
 Hills, W.
 Hobson, A. S.

Hogg, R.
 Holmes, W. M.
 Horncastle, J.
 Humpage, B.
 Hyne, H.
 Ince, J.
 Jackson, C.
 James, J. T.
 Jewell, R. J.
 Johnson, R. A.
 Jones, W. C.
 Keene, E.
 Keene, J.
 Kingsford, F.
 Lawrence, H.
 Laws, J.
 Lewinton, A. B.
 Lingwood, W.
 Long, H.
 Marlow, F. W.
 Martindale, W.
 Mason, R. W.
 Mathews, J. H.
 Matthews, W.
 Maudsley, W.
 Mellin, G.
 Mitchell, M. F.
 Moyle, J.
 Nash, H.
 Nutt, A. J.
 Palmer, G. D.
 Pearce, C.
 Pickard, W.
 Postans, A. W.
 Prichard, E.
 Reichardt, E.
 Reynolds, J. J.
 Richardson, B. W.
 Richardson, G.
 Robbins, J.
 Rowson, H.
 Samuel, J. B.
 Sandford, G. W.
 Sanger, W. A.
 Savory, A. L.
 Savory, J. F.
 Sharpe, G. Y.
 Shephard, T. F.
 Shirliff, W.
 Skidmore, J.
 Smith, J. T.
 Smith, W.
 Squire, A. H.
 Squire, P.
 Squire, P. W.
 Squire, W.
 Starling, H. W.
 Stevenson, W. L.
 Stuart, J. E.
 Taylor, J.

Thorn, J. J.
 Tily, C. A.
 Titley, T.
 Trotman, A. C.
 Tucker, R. L.
 Twinberrow, J. K.
 Verity, R.
 Watts, D. W.
 Watts, J.
 Waugh, H.
 Weston, S. J.
 Westrup, J.
 Whitbarn, A. R.
 Wilkinson, T.
 Williams, J. J.
 Williams, W. H.
 Wooster, J. R.
 Wright, C. R. A.
 Young, W.

London, W.C.

Akhurst, W. E.
 Attfield, J.
 Bannister, R.
 Bentley, R.
 Bletsoe, J.
 Bremridge, E.
 Bremridge, R.
 Buckle, C. F.
 Challice, W. G. W.
 Cocks, J. L.
 Courtenay, A.
 Davenport, H.
 Davenport, J. T.
 Davies, R. H.
 Fewtrell, W. T.
 Gerrard, A. W.
 Heaton, C. W.
 Hogg, J.
 Holmes, E. M.
 Huggins, R.
 Hunt, A.
 Huskisson, H. O.
 Jacks, E.
 Lamplough, H.
 Mackey, J. B.
 McCulloch, F.
 Morson, T.
 Moss, J.
 Passmore, F.
 Paul, B. H.
 Pedler, A.
 Redwood, T.
 Rich, S. W.
 Sainsbury, S.
 Salter, G.
 Stacey, S. Ll.
 Starkie, R. S.
 Stoker, G. N.

Taubman, R.
 Taylor, C. W.
 Thomas, H.
 Turner, C. E.
 Twemlow, F. E.
 Veitch, W.
 Willmott, W.
 Yarde, G.

Long Sutton.
 Sutterby, J. N.

Longton.
 Barlow, F.
 Prince, A. G.

Lostwithiel.
 Kemble, J.

Louth.
 Greenwood, J. T.
 *Hurst, J. B.
 Simpson, H. D.

Lowestoft.
 Collins, J. R.
 Farrett, W. B.
 Hall, T.
 Pearce, W. F.
 Rayson, A. J.
 Wright, A.

Ludlow.
 Nickson, J.

Luton.
 Wootton, P.

Lydd.
 Nowers, E. A.

Lymm, Cheshire.
 Evans, I. H.

Lynn, Norfolk.
 Allen, H. W.
 *Atmore, G.
 Cocher, J.
 Fuller, J. W.

Lytham.
 Bannerman, C. A.
 Cardwell, E.
 Crozier, R.

Macclesfield.
 *Bates, W. J.
 Hodgkinson, J.
 Smallwood, J. W.
 Wood, R.

Macduff.
 Cruickshank, J.

Maidenhead.

Judson, B. J. G.
Thompson, C. H.

Maidstone.

Brown, R. D.
Woolley, G. B.

Malvern Wells.

Bladon, W. G.
Morgan, W. J.
Wakefield, C. H.

Manchester.

Attenborough, H. R.
Barton, S. W.
Benger, F. B.
Blyton, J.
Boor, F.
Botham, J.
Bowden W.
(Patricroft.)
Brown, J.
Brown, W. S.
Bury, J.
Bushby, T.
Carruthers, R. B.
Carter, W.
Cooper, F. R.
Darling, W. H.
Davies, T.
Edwards, G.
Estcourt, C.
Gee, S.
Gibbons, T. G.
Gibson, J.
Gill, J. W.
Guilmette, J. W.
Hall, S.
Hardeman, J.
Hart, J.
Hart, T.
Hilditch, T.
Hinchliffe, F. G. U.
Hodgson, W.
Holland, E.
Holmes, N. W.
Holt, H.
Horne, G.
Hughes, E. G.
Hunt, L.
Jackson, A. H.
Jackson, G.
Johnson, T. S.
Jones, J.
Ker, A.
Kerfoot, T.
Lane, W.
Leete, W. W.
Marsden, T. B.

Mather, W.

Maunder, R.
Midgeley, C.
Mitchell, J.
Muir, M. M. P.
Mumbray, H. G.
Paine, S.
Payne, J. B.
Peatson, H. R.
Pidd, A. J.
Pratt, G. W.
Pritchard, J.
Rabson, H.
Ramsbottom, G.
Ridley, E. H.
Robinson, B.
Schorlemmer, C.
Searle, W. J.
Siebold, L.
Smith, J.
Spence, P.
Sugden, S.
Swinn, C.
Taylor, T. H.
Terry, T.
Thomson, W.
Twemlow, R.
Walker, S. J.
Wallwork, J.
(Tildesley).
Walters, R.
Walton, D.
Watts, W. A.
Wealthall, A.
West, T.
Westmacott, G. B.
Wheeldon, J.
Whittaker, E.
Whitworth, J.
Wild, F.
Wilkinson, G.
Wilkinson, W.
Wilks, M.
Williams, R.
Wilson, H.
Woodhead, W. H.
Woolley, G. S.
Woolley, H.
Wovenden, H.
Wylde, —
Yeats, T. F.

Mansfield.

*Agar, W.
Jackson, W.
Oldham, J.
Patterson, D. J.

Market Deeping.

Linnell, G.

Marlow.

Seaman, J. S.

Marlborough.

Rowe, P. M.

Marshfield.

Garland, J. F.

Maryport.

Cockton, J.
Dixon, J.

Matlock Bridge.

Hodgkinson, J. S.

Mayfield.

White, E. A.

Melbourne.

Earp, J.

Melksham.

Baines, J. C.

Melton-Mowbray.

Wing, T. N.

Mere, Wilts.

Bracher, E.

Merthyr.

Daniel, W. L.
Griffiths, H. W.
Lewellyn, R.
Lewis, J.
Thomas, R.
While, W. J.

Middlesboro-on-Tees.

Bell, F. R.
Brentnall, J. E.
Robson, J. C.
*Taylor, H. H.

Middleton.

Roberts, J.

Middleton, Teesdale.

Vipond, W. D.

Midhurst.

Langridge, T. B.

Mildenhall.

Chifney, G. J.

Milnthorpe.

Fothergill, S.

Minchinhampton.

Simpkins, J.

- Mirfield, Yorks.**
 Crook, C.
- Modbury.**
 Lakeman, N.
- Mold.**
 Barker, R.
 Williams, E.
- Monaghan.**
 Whitla, J.
- Monmouth.**
 Jones, E. H.
- Montgomery.**
 Marshall, W. P.
- Montrose.**
 Burrell, G.
- Morecambe.**
 Birkett, J.
 Gardner, T.
- Mount Sorrel.**
 Tibbles, J. T.
 Tibbles, W.
- Mountain Ash.**
 White, G. H.
- Morrison.**
 Bevan, M. L.
- Neath.**
 Hibbert, W.
 Hutchins, C.
- Needham Market,**
Suffolk.
 Harrington, A.
 Harrington, A.
- Nefyn.**
 Wilson, R. M.
- Newcastle-on-**
Tyne.
 Arnison, W. C.
 Beadel, A.
 Bellerby, M.
 Bolam, J.
 Bowman, H.
 *Brady, A.
 Brady, H. B.
 Brockett, R. H.
 Coates, J. M.
 Crozier, W.
 Dobson, J.
 Downie, H.
 Dunn, J.
 Frank, J. M.
- Hareus, J.
 Hume, A.
 Ismay, J.
 Ismay, J. G.
 Jobson, R.
 Kirkup, T.
 Marreco, A. F.
 Martin, N. H.
 Mather, J. H.
 Owen, W.
 Parker, M.
 Pattinson, J.
 Potts, T.
 Proctor, B. S.
 Spencer, P.
 Stark, J. S.
 Swan, J. W.
 Todd, H. T.
 Watson, M.
 Watson, T. E.
 Webster, E. P.
 Welch, T.
- Newcastle-under-**
Lyne.
 Cartwright, W.
 Gould, J.
 Poole, J.
- Newmarket.**
 Rogers, A. R.
- Newport, I. W.**
 Millidge, W. H.
- Newport, Mon.**
 Faulkner, H.
 Garrett, J.
 Paine, C.
 Young, J.
- Newport Pagnell.**
 Taylor, T.
- Newport, Salop.**
 Picken, T. W.
- New Thornley.**
 Smith, I.
- Newton Abbot.**
 Godfrey, F.
 Ponsford, J.
 *Poulton, J.
- Newton Stewart.**
 MacCreath, J.
- Newtown, Mont-**
gomeryshire.
 Lambert, W. H.
- Northallerton.**
 Fairburn, J.
 Pick, R.
 Warrior, H.
- Northampton.**
 *Bingley, J.
 Dadford, T.
 Druce, G. C.
 Griffin, T.
 Harris, J.
 Maxwell, G. N.
 Mayger, W. D.
 Mayger, W. J.
 Negus, S.
 Sandall, W.
 Shipman, J. J.
- North Shields.**
See SHIELDS.
- Northwich.**
 Clough, J.
 Lee, W.
- Norwich.**
 Archbold, G.
 Butler, J. G.
 Caley, A. J.
 Cooke, W.
 Cooke, W. K.
 Corder, O.
 Cossey, J.
 Cubitt, C.
 Eldridge, J. H.
 Fitch, R.
 Fuller, T. B.
 Hill, A.
 Pitts, R. C.
 Robinson, J.
 Row, G.
 Smith, J. De Carle
 Smith, R. B.
 *Sutton, F.
 Tice, R.
 Watson, J. E. H.
- Nottingham.**
 *Atherton, J. H.
 Beardsley, J.
 Blankley, W.
 Dadley, E.
 Dennis, J. L.
 Fitzhugh, R.
 Guest, W.
 Jackson, R.
 Jenkins, J.
 Jenkins, J. T.
 Manfull, H. J.
 Oakland, C.
 Oakland, W.

- Parker, W. H.
 Parr, S.
 Rayner, J.
 Smith, W.
 Truman, H. V.
 Waterall, G. E.
 White, F.
 Wilford, J.
 Williams, W. P.
 Wood, W. H.
- Nuneaton.
 Iliffe, T. P.
- Oakham.
 Plant, W. E.
 Wellington, J. M.
- Oldham.
 *Bagshaw, W.
 Berry, T.
 Braddock, H.
 Firth, W.
 Hargraves, H. L.
 Hurst, J.
 Jackson, J. T.
 Jackson, R.
 Parkinson, W.
 Shepherd, J.
- Oldmeldrum, N. B.
 Daniel, A.
- Olney.
 Fever, W.
- Ossett.
 Moore, R.
- Oswaldtwistle,
 near Accrington.
 Haworth, W.
- Otley.
 Pratt, R. M.
- Oundle.
 Firman, H. E.
 Roper, H. E.
 Turner, R.
- Over Darwen.
 Cronshaw, C.
- Oxford.
 Hitchcock, C. E.
 Houghton, T.
 Luff, W.
 Odling, W.
 Pitchford, W.
 Prior, G. T.
 Thurland, H.
- Padiham.
 Midgley, F.
- Paisley.
 McMurray, J.
- Paignton.
 Merson, W.
- Peebles.
 Morison, G.
- Pembroke.
 John, D. W.
- Pembroke Dock.
 Andrews, C.
- Penistone.
 White, L. P.
- Penrith.
 *Kirkbride, W.
 Redfern, T.
 Wilson, J.
- Pentraeth.
 Elias, J. R.
- Penzance.
 Cornish, H. R.
- Perth.
 Blair, R. P.
 Dandie, D.
 Gowans, J.
 Reid, N.
 Wilson, J.
- Peterboro.
 Bright, R.
 Read, H. H.
- Petersfield.
 Edgeter, W. B.
- Plymouth.
 *Balkwill, A. P.
 Burdwood, J.
 Coker, O. C.
 Elliott, S., junr.
 Furneaux, W. H.
 Header, H. P.
 Langdon, F. B.
 Lewin, W.
 Moore, W. V.
 Turney, S. B.
 Waterfall, W.
- Poole.
 Atkins, T. W.
 Penney, W.
- Pontardulais.
 Hinds, H. D.
- Pontypridd.
 Bassitt, C.
- Portishead.
 Bond, H.
- Portobello.
 Fitzgerald, A. H.
 Kemp, D.
 Nesbit, J.
- Portree (I. of Skye).
 Mitchell, A.
- Portsea.
 Spear, G.
- Portsmouth.
 Lewis, J.
- Portsoy.
 Clark, J.
- Port Talbot.
 Evans, E.
 (Aberavon.)
- Prescott.
 Clay, R. (Rainhill.)
 Slack, J. L.
- Presteigne.
 Hughes, W., junr.
- Preston.
 Bell, J. A.
 Brown, W. B.
 Dagers, F.
 Frill, W. E.
 Hargreaves, M.
 Hillidge, G.
 Mercer, J.
 Tomlinson, J.
 Willan, W.
 Worthington, W.
 Wright, J. A.
- Prestonkirk.
 Trotter, J.
- Prestwich.
 Johnson, F.
 Mercer, A.
- Princes Risboro',
 Bucks.
 Ridley, H.
- Queenstown.
 Houghton, R. W.
- Ramsbottom.
 Hedley, T.
 Morton, J.

- Ramsey.**
Palmer, F. W.
- Ramsgate.**
Balch, E.
Daniel, S.
Fisher, C.
Fisher, H. A.
Franks, A.
Morton, H.
- Rawtenstall, Lancs.**
Halstead, H.
Lord, L.
- Reading.**
Bailey, J. B.
Bartle, W.
Dowling, R.
Hill, Mr. J.
Welch, C.
Wilson, J. P.
- Redcar.**
Dowson, J.
- Redditch.**
Harris, J.
Taylor, R.
Wheeler, C.
- Redhill.**
Padwick, T.
Silliton, F. H.
- Redruth.**
Edwards, R. S.
Rowe, S. T.
- Rhyl.**
Foulkes, W. H.
Jones, E. P.
- Rhynie.**
Roger, J. P.
- Richmond, Surrey.**
Clarke, T. M.
Hopwood, T. S.
Mumbray, R. G.
- Richmond, Yorks.**
*Thompson, J. T.
Thompson, L.
Thompson, T.
Walton, G. R.
- Riddings, Derby.**
Shaw, A.
- Ridgeway.**
Archer, A.
- Ripley, Derby.**
Daykin, K.
- Rochdale.**
Aspinall, J.
Bamford, J. W.
Booth, J.
Hadfield, J.
Lynch, E. B.
Mason, A.
*Robinson, R.
Taylor, E.
Turner, H.
- Rochester.**
Harris, H. W.
- Romsey, Hants.**
Slater, W. H.
- Rothbury, North-
umberland.**
Farrage, R.
Riddell, H. B.
- Rotherham.**
*Davy, H.
France, J.
Greaves, E. (Mexbro')
Gregory, W.
Johnson, A.
- Rothsay.**
Duncan, W.
Macintosh, A.
- Rothwell.**
Ginns, A. B.
- Royston, Herts.**
Bull, B.
*Matthews, E.
- Ruabon.**
Yardley, E.
- Rugby.**
Garratt, S.
Smith, A. P.
- Runcorn.**
Whittaker, W.
- Rutherglen, N.B.**
Black, J.
- Ruthin.**
Bancroft, J. J.
Rouw, W. T.
- Ryde, I. W.**
Dixon, H.
Flower, T. S.
Gibbs, W.
- Gurnell, W.
*Pollard, H. H.
Taylor, R.
- Rye.**
Smith, A. W.
- Saffron-Walden.**
Gilling, J.
Machon, H.
Midgley, J. H.
- Saint Albans.**
Lewis, H.
Martin, H. G.
- Saint Asaph.**
Roberts, O.
- Saint Austell, Corn-
wall.**
Dunn, S.
Geldard, J.
- Saint Clear's.**
Williams, R.
- Saint David's.**
Hughes, H. M.
- Saint Day, Corn-
wall.**
Corfield, C.
Corfield, T. J. T.
- Saint Helen's, Lan-
cashire.**
*Cotton, J.
Hibbert, J.
Sherlock, T.
- Saint Ives.**
Williams, J. V.
- St. Leonard's-on-
Sea. (See Hastings.)**
- Saint Neots.**
Gudgen, G. B.
Mellor, J. G.
- Salford.**
Wagh, J.
- Salisbury.**
*Atkins, S. R.
Bennett, T. J.
Chamberlain, W.
(Downton.)
Orchard, E. J.
Read, J.

- Saltaire.**
 Bayley, G. H.
- Saltburn-by-the-Sea.**
 Duck, W. B.
 McLean, K.
- Sandbach, Cheshire.**
 Clisby, S.
 Gee, G.
- Sandown, I. W.**
 Brown, G.
 Huggins, W.
- Sandwich.**
 Baker, F.
- Saundersfoot.**
 Mathias, T.
- Scarborough.**
 Bland, H.
 Porrett, G. W.
 Simons, R. J.
 Smart, J.
 *Whitfield, J.
- Selby.**
 *Colton, T.
 Cutting, T. J.
 Taylor, F.
- Selkirk.**
 Borthwick, A. J.
- Settle.**
 Brockbank, E.
 Procter, W.
 Watts, W. M.
- Sevenoaks.**
 Romans, T. W.
 (Wrotham.)
- Shanklin, I. W.**
 Brown, A. H.
- Sheerness.**
 Bray, J.
- Sheffield.**
 Allen, A. H.
 Baker, W.
 Bennett, R.
 Booth, W. H.
 Botham, W.
 Brown, G. B.
 Clayton, W.
 Cubley, G. A.
 Dobb, J. T.
 Ellinor, G.
- Eyre, S.
 Harrison, G.
 Harrison, J.
 Horncastle, H.
 Jenkinson, J. H. D.
 Leslie, J. B.
 Maleham, H. W.
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 Owen, G. B.
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 *Radley, W. V.
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 Wilson, E.
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- Shefford.**
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- Shepton Mallett.**
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- Sherborne, Dorset.**
 Dalwood, J. H.
- Sherburn, South Milford, Yorks.**
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- Shields (North).**
 Roddam, H. R.
- Shields (South).**
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- Shipley.**
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- Shoeburyness.**
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- Shrewsbury.**
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- Southgate, Middlesex.**
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- South Molton.**
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- Southport.**
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- Sunbury-on-Thames.**
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 Harrison, W. B.
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 Thompson, H.
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- Sutton Coldfield.**
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- Sutton, Surrey.**
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 Hill, J.
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- Swinton.**
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- Tenby.**
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- Tetbury.**
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- Tewkesbury.**
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 Walker, J.
- Thame.**
 Davies, J. R.
- Thaxted.**
 Rust, J.
- Thorne, near Doncaster.**
 Knowles, C. W.
- Thornley Colliery.**
 Galt, W. D.
- Thrapstone.**
 Brown, E. W.
 Pars, R. C.
- Tipton.**
 Butler, J., junr.
 Swinnerton, W.
- Tiverton.**
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 Tuck, G. F.
- Todmorden.**
 Buckley, R.
 *Lord, C.
 Stevenson, W.
- Torquay.**
 Bridgman, W. L.
 Brown, E. W.
 Clarke, R. F.

- | | | |
|-------------------|------------------|--------------------|
| Cocks, J. W. | Tynemouth. | Warminster. |
| Guyer, J. B. | Atkinson, J. | Humby, L. W. |
| Hartt, C. | | Rawlings, C. J. |
| * Hearder, W. | Uckfield. | |
| Martin, F. R. | Goulden, E. B. | Warrington. |
| Shapley, C. | | Bennett, J. |
| Smith, E. | Ulverston. | Hargreaves, J. |
| Watson, D. | Downard, J. | * Webster, S. M. |
| West, J. | Mackereth, H. W. | Young, J. C. |
| | Radnall, W. H. | |
| Torrington. | | Warwick. |
| Handford, E. | Uppingham. | Baly, J. |
| | Hope, W. | * Williams, C. J. |
| Totnes. | | |
| Keen, B. | Uttoxeter. | |
| Seccombe, F. | Johnson, J. B. | Watford. |
| | Woolrich, C. B. | Collins, J. |
| Tottenham. | | Chater, E. M. |
| Donston, W. | Ventnor, I. W. | |
| Howard, J. E. | Weston, C. | Wath-on-Dearne. |
| | | Hick, A. |
| Tow Law. | Wadebridge. | |
| Bell, F. E. | Philp, J. | Wednesbury. |
| Rutherford, E. | Rickard, J. R. | Gittoes, S. J. |
| | | Skirving, G. |
| Tredegar. | Wakefield. | |
| Watkins, W. H. | Cardwell, J. | Welchpool. |
| | Carr, J. | Jones, T. P. |
| Tregaron. | Chaplin, J. L. | |
| Rowlands, D. | Job, C. F. | Wellingborough. |
| | Moorhouse, W. | Sargeant, J. W. |
| Treherbert. | | |
| Jones, R. T. | Wallingford. | Wellington, Salop. |
| | Payne, S. | Bates, J. |
| Trimpley. | Upton, E. J. | Tipton, St. John. |
| Steward, J. | | |
| Tring, Herts. | Walsall. | Wellington, |
| Jeffrey, G. | Bayley, J. T. | (Somerset). |
| | Grove, H. | Langford, J. B. |
| Trowbridge. | Highway, H. | |
| Dyer, H. | * Hobson, H. | Wells. |
| Hayward, W. H. | Lindop, W. J. | Manning, R. J. |
| | (Bloxwich). | Slater, J. |
| Turriff. | Morris, J. O. | |
| Fowlie, G. | | Welwyn. |
| | | Lawrance, E. |
| Tunbridge Wells. | Walsham-le-Wil- | |
| Arnold, S. | lows. | Westbury. |
| * Cheverton, G. | Wilson, T. | Bailey, T. |
| Dunkley, E. | | Taylor, S. |
| Nicholson, A. | Walton-on- | |
| Panes, G. | Thames. | West Auckland. |
| Sells, R. J. | Makins, G. H. | Townend, J. W. |
| | Power, E. | |
| Tunstall, Staffs. | Wanstead. | West Bromwich. |
| Oulton, W. P. | Rayson, H. | See BROMWICH, |
| | | WEST. |
| Tuxford. | Wargrave. | |
| Gain, W. A. | Soames, W. | West Cowes, (Isle |
| | | of Wight). |
| Twickenham. | Warley, Great, | Fennings, A. |
| Peake, H. F. | Essex. | |
| Shelley, H. | Hayes, J. | West Hartlepool. |
| | | Emerson, C. |

- Weston-super-Mare.**
 *Gibbons, G.
 Matthias, J. J.
 Rich, T.
- Weymouth.**
 Gregory, W.
 *Groves, T. B.
 Mason, A.
 Simmons, A.
 Targett, C. G.
 Walford, R. J.
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 Kitchin, A.
- Whitstable.**
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- Widnes, Lancs.**
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- Wigton.**
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- Willington.**
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- Wilton.**
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- Wimbledon.**
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- Winchester.**
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- Windsor.**
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 Grisbrook, E.
 Russell, C. J. L.
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 Burgess, R.
- Winterton.**
 Cross, C.
- Wishaw.**
 Macfarlane, T. B.
- Witham, Essex.**
 Green, R. P.
- Withernsea, Yorks.**
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- Witney.**
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- Woburn.**
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- Wolverhampton.**
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 Scott, W. L.
- Wooler.**
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- Worcester.**
 Ferneley, C.
 George, H.
 Twinberrow, J.
 Virgo, C.
 Whitfield, H.
 Willis, B. W.
 *Witherington, T.
- Workington.**
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 Archibald, G. T.
- Workshop.**
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 Marris, T.
- Worthing.**
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 Cortis, C.
- Wrentham.**
 Farrer, F.
- Wrexham.**
 Edisbury, J. F.
 Rowland, W.
- Wymondham.**
 Skoulding, W.
- Yarmouth. See GREAT YARMOUTH.**
- Yeadon.**
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- Yeovil.**
 Helliar, E.
 *Maggs, T. C.
- York.**
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 Bulmer, F.
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 Cooper, T.
 Croskell, C.
 Dresser, R.
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 Moon, R. P.
 Oglesby, J.
 O'Neill, J.
 Parker, T.
 Proctor, W.
 Shann, G.
 Slinger, F.
 Thompson, W. M.
 Tollinton, R. B.
 Ward, J. S.
 Wilson, T. W.
 Wright, F.
- York Town, Farnborough Station.**
 Claypole, A. H.
- Addresses Unknown.**
 Aslin, R.
 Bell, J. C.
 Burnett, J. D.
 Carter, F. P.
 Davis, J. M.
 Diaper, A.
 Flower, E.
 Hampson, P.
 Heppell, H.
 Hill, W.
 Lazenby, J. W.
 Levie, A. M.
 Lorrain, J. G.
 Norrish, J.

Pattison, F.
Pearson, E.
Radford, J. C.
Shepherd, C. W.

Sinclair, G.
Stainthorpe, W. W.
Steven, D. P.
Turner, A.

Walker, J. S.
Wall, T.
Watling, A.
Young, T.

NOTICE.

Members will please report any inaccuracies in these lists to

PROFESSOR ATTFIELD, *Hon. Gen. Sec.*,
17, Bloomsbury Square,
London, W.C.

LOCAL ASSOCIATIONS.

INVITED TO SEND DELEGATES TO THE ANNUAL MEETING.

- ABERDEEN.—Society of Chemists and Druggists (1839). C. Davidson, 205, Union Street, Aberdeen.
- ASHTON-UNDER-LYNE.—Ashton-under-Lyne and Dunkinfield Chemists' Association (1869). E. Fisher, 106, Stamford Street, Ashton-under-Lyne.
- BIRMINGHAM.—Midland Counties Chemists' Association (1869). W. J. Lucas, Colemore Row, Birmingham. Chemists' Assistants' Association (1868). F. G. Homer, Birmingham.
- BRADFORD.—Chemists' Association. H. G. Rogerson, Bradford.
- BRIGHTON.—Association of Pharmacy. Mr. J. H. Matthews, 101, Western Road, Brighton.
- BRISTOL.—Pharmaceutical Association (re-established 1869). G. F. Schacht, 7, Regent Place, Clifton, near Bristol.
- COLCHESTER.—Association of Chemists and Druggists (1845). J. L. Chaplin, 124, High Street, Colchester.
- DUNDEE.—Chemists and Druggists' Association.
- EDINBURGH.—North British Branch of the Pharmaceutical Society of Great Britain. John Mackay, F.C.S., 119, George Street, Edinburgh.
- EXETER.—Exeter Pharmaceutical Society (1845). R. Walton, 246, High Street, Exeter.
- GLASGOW.—Chemists and Druggists' Mutual Improvement Association (1854). J. A. Clarke, 132, London Street.
- GOSPORT.—Y. L. Strachan, High Street, Gosport.
- HALIFAX.—Halifax and District Chemists and Druggists' Association (1868). W. C. Hebden, 64, North Gate, Halifax.
- HULL.—Chemists' Association (1868). C. B. Bell, 6, Spring Bank, Hull.
- LEEDS.—Chemists' Association (1862). Mr. Wilson, 13, Briggate, Leeds.
- LEICESTER.—Chemists' Assistants and Apprentices' Association (1869). 15, Belvoir Street, Leicester.
- LINCOLN.—Chemists' Association. C. F. Gadd, 200, High Street, Lincoln.
- LIVERPOOL.—Chemists' Association (1868). E. Davies, F.C.S., Royal Institution, Colquitt Street, Liverpool.
- MANCHESTER.—Chemists and Druggists' Association. F. B. Bengier, F.C.S., 7, Exchange Street, Manchester.
- NEWCASTLE-ON-TYNE.—University of Durham. Chemists Assistants' Association. Mr. A. Brady, 29, Mosley Street.
- NORTHAMPTON.—Chemists' Assistants and Apprentices' Association. G. C. Druce, 6, Drapery, Northampton.
- NORWICH.—Chemists' Assistants' Association, 2, London Street.
- NOTTINGHAM.—Nottingham and Notts Chemists' Association. Mr. Fitzhugh, Nottingham.
- OLDHAM.—Chemists and Druggists' Assistants and Apprentices' Association. J. Taylor, 28, High Street, Oldham.
- PLYMOUTH.—Association of Chemists for Plymouth, Devonport, and Stonehouse. G. Breeze, Catherine Street, Devonport.
- SCARBOROUGH.—Chemists' Association (1870). J. Whitfield, F.C.S., 18, Westbro', Scarborough.
- SHEFFIELD.—Pharmaceutical and Chemical Association. Mr. Learoyd, 74, Market Place, Sheffield.
- SUNDERLAND.—Chemists' Association. J. J. Nicholson, 226, High Street West, Sunderland.
- TAUNTON.—Chemists' Association (1870). H. Prince, Fore Street, Taunton.
- TYNESIDE.—Chemists' Assistants' Association. Mr. G. H. Pavator.
- WOLVERHAMPTON.—Chemists and Druggists' Association. Mr. W. Y. Brevitt, Darlington Street, Wolverhampton.
- YORK.—Chemists' Association. T. P. Bulmer, Low Ousegate, York.

PRESENTATION COPIES of THE YEAR-BOOK OF PHARMACY are forwarded to the following :—

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ASSOCIATIONS.	SECRETARIES.
Aberdeen Society of Chemists and Druggists.	Mr. C. Davidson, 205, Union Street, Aberdeen.
Colchester Association of Chemists and Druggists.	Mr. J. L. Chaplin, 124, High Street, Colchester.
Exeter Pharmaceutical Society	Mr. R. Walton, 246, High Street, Exeter.
Halifax and District Chemists and Druggists' Association.	Mr. W. C. Hebden, 64, North Gate, Halifax.
Hull Chemists' Association	Mr. C. B. Bell, Spring Bank, Hull.
Leeds Chemists' Association	Mr. J. W. Longley, 40, Wade Lane, Leeds.
Leicester Chemists' Assistants and Apprentices' Association	Mr. —, 15, Belvoir Street, Leicester.
Liverpool Chemists' Association... ..	Mr. A. H. Mason, 313, Upper Parliament Street, Liverpool.
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Nottingham and Notts Chemists' Association	Mr. J. S. Mayfield, High Street, Nottingham.
North British Branch of the Pharmaceutical Society	Mr. J. Mackay, 119, George Street, Edinburgh.
Oldham Chemists and Druggists' Assistants and Apprentices' Association.	Mr. E. Richards, 30, High Street, Oldham.
Sheffield Pharmaceutical and Chemical Association	Mr. H. W. Maleham, 7, Westbar, Sheffield.
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The following Journals are sent by their respective Editors in exchange for the YEAR-BOOK OF PHARMACY.

Archiv der Pharmacie, from Professor D. E. REICHARDT, Jena.

American Journal of Pharmacy.

The British Medical Journal.

The Chemical News.

Journal de Pharmacie d'Anvers, from M. VAN PELT, Marché aux Bœufs, 27, Antwerp.

Journal de Pharmacie et de Chimie, from M. G. MASSON, 17, Place de l'Ecole de Médecine, Paris.

Neues Repertorium für Pharmacie, from Dr. L. A. BUCHNER, München.

Pharmaceutische Centralhalle, from Dr. HERMANN HAGER, Pulver Mühle bei Fürstenberg-on-Oder.

PROGRAMME OF THE PROCEEDINGS
OF THE
BRITISH PHARMACEUTICAL CONFERENCE,
AT THE
TWELFTH ANNUAL MEETING, BRISTOL, 1875.

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Who have filled the office of President.

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LOUIS SIEBOLD.

Editor of the Transactions.

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WARNER, T.

WHITE, J. W.

THE SITTINGS OF THE CONFERENCE WERE HELD IN
THE BRISTOL MUSEUM AND LIBRARY, QUEEN'S ROAD, CLIFTON.
ON TUESDAY AND WEDNESDAY, AUGUST 24TH AND 25TH.
Commencing at Ten a.m. each day.

MONDAY, August 23rd.

The EXECUTIVE COMMITTEE met according to notices from the Secretaries, at 8.0 p.m., at the Museum and Library.

TUESDAY, August 24th.

The CONFERENCE met at 10 o'clock a.m., adjourning at 12.30 p.m.; and at 2 o'clock p.m., adjourning at 4.30 p.m.

Order of Business:

- Election of Members.
- Reception of Delegates.
- Report of Executive Committee.
- Financial Statement.
- President's Address.
- Reading of Papers and Discussions thereon.

PAPERS.

1. *Linimentum Terebinthinae Aceticum.* W. SYMONS, F.C.S.
2. *Report on the Chemistry of the Aconite Alkaloids.* Dr. C. R. ALDER WRIGHT.
3. *Pharmaceutical Experiments on the Bristol Rocks.* W. W. STODDART, F.C.S.
4. *The Microscopy of Natal Arrowroot.* T. GREENISH, F.C.S.
5. *Further Researches on the Crystalline Constituents of Barbadoes and Socotrine Aloes.* WILLIAM A. TILDEN, D.Sc., London.
6. *The possible Applications of Salicylic Acid, in Pharmacy.* F. B. BENDER, F.C.S.
7. *Report on the Magnesian Carbonates of Trade.* Mr. J. C. THRESH.
8. *Citrate of Lithium.* CHAS. UMNEY, F.C.S.
9. *Note on the Cultivation of Saffron in the Abruzzi.* Mr. HENRY GROVES.

On Tuesday and on Wednesday, between 12.30 and 2—that is to say during the mid-day adjournment—ladies and gentlemen attending the Meeting were invited by the Local Committee to partake of a Luncheon served in the Volunteer Club, adjoining the Museum and Library.

WEDNESDAY, August 25th.

The Executive Committee met at 9.0 a.m., at the Museum and Library.

THE CONFERENCE met at 10 o'clock a.m., adjourning from 12.30 p.m. till 2 o'clock p.m. The whole of the business of the Conference was completed this day at 4.30 p.m.

Order of Business:

Election of Members.

Reception of Delegates.

Reading of Papers and Discussions thereon.

PAPERS.

10. *Aqua Chloroformi.* T. B. GROVES, F.C.S.
11. *Researches on the Oxidation of Essential Oils.* CHAS. T. KINGZETT, F.C.S.
12. *Report on Jaborandi.* MR. A. W. GERRARD.
13. *Report on the Phosphate of Calcium of Trade.* MR. J. F. BROWN.
14. *Note on the Preservation of Hydrocyanic Acid.* J. WILLIAMS, F.C.S.
15. *Japanese Oil of Peppermint.* DR. C. R. ALDER WRIGHT, F.C.S.
16. *New Derivatives from the Opium Alkaloids.* DR. C. R. ALDER WRIGHT, F.C.S.
17. *The Horsley-Stoddart Method of Estimating Fat in Milk.* A. H. ALLEN, F.C.S.
18. *On the Use of Optical Analysis in Pharmacy.* MR. H. POCKLINGTON.
19. *Roger de la Bastie's Hardened Glass.* MR. H. POCKLINGTON.
20. *Commercial Compound Colocynth Pill.* MR. W. LAIRD.

Place of Meeting for 1876.

Election of Officers for 1875-1876.

FRIDAY, August 27th.

A pleasant excursion to Wells Cathedral and the Cheddar Cliffs and Caves, was arranged for the Members of the Conference by the Pharmacists of Bristol.

BRITISH PHARMACEUTICAL CONFERENCE.

MEETING IN BRISTOL, 1875.

THE twelfth annual meeting of the British Pharmaceutical Conference was commenced on Monday, August 23, at the Bristol Museum and Library, under the presidency of Mr. T. B. Groves, F.C.S.

MEETING OF THE EXECUTIVE COMMITTEE.

On Monday evening, a meeting of the Executive Committee was held. Present—Mr. T. B. Groves, President (in the chair); Messrs. Schacht, Stoddart, Boorne, Townsend, Pitman, Tilden, Brady, Ekin, Umney, Hills, Carteighe, Greenish, Martindale, and Attfield.

The minutes of the previous meeting were read and confirmed.

Professor Attfield reported that the usual "lists of subjects" and other printed matter had been sent to members, and also described means he had adopted to enlist the interest of scientific men not directly connected with pharmacy. About 300 subscriptions remained unpaid after repeated applications.

Mr. BENDER read a draft report of the Executive Committee, which was accepted.

Professor ATTFIELD submitted a "programme of proceedings" at the sittings of members during the two following days, which, with some additions, was agreed to.

Mr. SIEBOLD laid on the table the MS. of the *Year-Book of Pharmacy* for 1875.

Mr. SCHACHT, Treasurer, read a financial statement showing a very satisfactory balance in hand on the general account of the Conference. The Treasurer also submitted a statement showing the financial condition of the Bell and Hills Fund.

A question as to the advisability of continuing to receive advertisements in the *Year-Book of Pharmacy* was introduced by Professor Attfield, and, after discussion, finally referred to the Year-Book Committee.

GENERAL MEETING.

TUESDAY, AUGUST 24TH.

The first sitting, for the reading and discussion of papers, was held on Tuesday, at 10 a.m., when Mr. C. Boorne, as Chairman of the Local Committee, gave a hearty welcome to the members of the Conference.

A letter was read, signed by the President and Corresponding Secretary of the Philadelphia College of Pharmacy, inviting any members of the Conference who may be present at the International Exposition and Meeting of the American Pharmaceutical Association in Philadelphia next year, to make the College Building their head-quarters.

Mr. BRADY bore testimony to the kindness and hospitality shown to him by American pharmacists a few years since, and advised intending visitors to provide themselves with proper credentials as to their standing.

Professor ATTFIELD said he would be happy to furnish any member of the Conference with such credentials.

The Secretaries were requested to acknowledge the receipt of the letter.

THE BELL AND HILLS FUND.

Professor ATTFIELD called attention to a copy of Watts' "Chemistry," including the supplementary volumes, which had been selected for presentation to the Bristol Pharmaceutical Association, in accordance with the regulations of the Bell and Hills Fund.

Mr. BOORNE asked to be allowed to express the thanks of the Association for the timely gift. He said the Association had hitherto been without a library, but he hoped these volumes would prove to be a starting point for one.

RECEPTION OF DELEGATES.

The following list of delegates to the Conference from various associations was then read :—

North British Branch of the Pharmaceutical Society.—Mr. George Blanshard, Mr. Tait (Chairman of Edinburgh Board of Examiners), Mr. J. Young, Mr. John Mackay, Hon. Sec., N.B. Branch.

The Brighton Association of Pharmacy.—Mr. W. D. Savage, J.P., President.

Liverpool Chemists' Association.—Mr. Redford, Mr. Shaw.

Wolverhampton Chemists and Druggists' Association.—Mr. Stokes-Dewson, Mr. W. B. Cooley, Mr. F. S. Barrett, F.C.S., Hon. Sec.

Manchester Chemists and Druggists' Association.—Mr. Louis Siebold, F.C.S., Mr. F. Baden Benger, F.C.S., Hon. Sec.

REPORT OF THE EXECUTIVE COMMITTEE.

Mr. BENDER (Honorary Secretary) then read the following report :—

Your committee have little but congratulations to offer in their Eleventh Annual Report to the members of the British Pharmaceutical Conference. Since the last general meeting continued efforts have been made to bring the Conference and its aims as prominently as possible before the pharmacists of Great Britain, and the result has been highly satisfactory. At a meeting of the Executive Committee held in May, Professor Attfield reported that since the commencement of the Conference year he had received 2328 subscriptions, of which 1800 had been sent in response to a first appeal, 392 after applying a second time, 136 members required three applications, and 422 remained still unpaid. The total number of members was about 2750. He had been endeavouring to interest colonial pharmacists in the Conference, and as a result several Australian chemists had joined. Some of these had requested to be supplied with back volumes of the *Year-Book* and had offered to contribute any local information required in aid of research. Our list of members now includes the names of many eminent men of science only indirectly connected with pharmacy, but whose willingness to associate themselves with the Conference indicates a recognition of its aims and an appreciation of its efforts to advance pharmaceutical science, which will be gratifying and encouraging to all its members.

During the first eleven years of its existence, this Association has at its annual meetings made a clear addition of upwards of 250 original researches to the common stock of chemical and pharmaceutical knowledge, has organized in different parts of England four exhibitions of objects of interest relating to pharmacy, has latterly presented to every member in exchange for his subscription of 7s. 6d. a *Year-Book* of 600 pages containing abstracts of researches at home and abroad, and has now gathered into membership, and thus permanently excited their interest in its department of applied science, nearly 3000 workers in pharmacy.

But whilst recording the increased prosperity and capabilities of our Association, the sad reflection is forced upon us that since the last annual meeting we have passed over the grave of Daniel Hanbury, one of our most revered presidents, and one of the most highly honoured amongst pharmacists.

As the Conference has grown and its influence widened, so has the individual responsibility of its members deepened. The transactions of the Conference receive considerable prominence through the English, Continental, and American pharmaceutical press, and in the *Year-Book of Pharmacy* they now find their way into the hands of pharmacists in almost every country. Our "Proceedings"

are perused by those competent to criticize as well as by those anxious for information and practical suggestions. Bearing in mind that the chief aim of the Pharmaceutical Conference is to encourage original research, your committee very earnestly appeal to the rapidly growing body of cultivated pharmacists to work out some of the problems which constantly present themselves. Ours is a branch of applied science so peculiarly rich in materials that "it supplies us," as Professor Hofmann recently said at an evening meeting of the Pharmaceutical Society, "with an endless variety of subjects," the most trivial being of sufficient importance to make every fragment of discovered truth concerning it valuable.

The establishment of an Irish Pharmaceutical Society, with an examining board, will probably develop a large amount of latent pharmaceutical talent in the sister isle, and your committee look for a great addition to our membership roll and to our list of contributors as amongst the possible results of recent pharmaceutical legislation in Ireland.

Your committee have already expressed their regret at the unavoidable delay in the publication of the *Year-Book*, which occurred in consequence of the illness of the editor; but they are glad to announce that the MS. of the 1875 volume was laid on the table at the meeting of the Executive Committee last evening. Its issue at an early date is therefore fully assured.

The salary of the assistant-secretary, Mr. R. H. Davies, has been increased from £25 to £40, dating from the commencement of the current year.

Several applications for grants from the Bell and Hills Library and Research Fund have been sent in to the general secretaries, and will be considered by the Committee during the meeting.

The Treasurer (Mr. G. F. SCHACHT, F.C.S.) presented the following balance-sheet:—

The Treasurer in Account with the British Pharmaceutical Conference.

Dr.	£	s.	d.
To Cash in hand, July 1st, 1874	3	8	9
„ Sale of <i>Year-Books</i> by Secretary	30	14	4
„ „ „ Publisher	13	0	0
„ Advertisements in 1872 <i>Year-Book</i>	1	8	6
„ „ „ 1873 „	18	18	0
„ „ „ 1874 „	112	7	0
„ Subscriptions received from Members	903	9	2
	£1083	5	9

<i>Cr.</i>		£	s.	d.
By Expenses connected with <i>Year-Book</i> :—				
Butler & Tanner, for printing, band-				
ing, and binding	£465	13	10	
Editor's Salary	100	0	0	
Messrs. Churchill—commission on				
advertisements	33	3	4	
Delivery of 2500 copies	80	0	0	
Advertising <i>Year-Book</i>	2	16	0	
Foreign Journals (Nutt)	2	8	0	
				684 1 2
„ General Printing:—				
Butler & Tanner	4	4	0	
Stevens & Richardson	29	17	0	
Parkins & Gotto	14	7	8	
				48 8 8
„ Directing Circulars and Envelopes	4	8	1	
„ Assistant Secretary's Salary	40	0	0	
„ Postage	52	9	3	
„ Sundries, including making of two large Cupboards,				
etc.	14	17	5	
„ Balance in hand	239	1	2	
				£1083 5 9

The Bell and Hills Fund.

<i>Dr.</i>		£	s.	d.
To cash in hand, July 31st, 1874	42	2	6	
„ Dividends on Russian Bonds, September, 1874,				
and March, 1875	7	7	10	
				£49 10 4

<i>Cr.</i>		£	s.	d.
By Grant of Books to Bristol	10	10	0	
„ Balance	39	0	4	
				£49 10 4

Examined and found correct,

EDWARD SMITH,	} Auditors.
FREDERICK ANDREWS,	

A motion that the report and balance-sheet should be accepted was agreed to unanimously.

ADDRESS OF THE PRESIDENT TO THE MEMBERS OF THE BRITISH PHARMACEUTICAL CONFERENCE.

The President then delivered the following Address:—

In proceeding a second time to address you from the highly

honourable position of the presidential chair, I feel compelled to allude to special circumstances investing this meeting of the British Pharmaceutical Conference with peculiar interest. We may, first of all, congratulate ourselves heartily that we are again united to our elder brother, the British Association for the Advancement of Science, and that circumstances do not now, as they did last year, impose an obstacle to that fraternal companionship. A meeting of the Conference in a provincial city, no matter how distinguished for devotion to our particular art, would, without such inducement to attendance, be I fear a comparative failure. Fortunately, we last year were spared such a reproach by the fact that the *locus in quo* was the metropolis, and our entertainers the Pharmaceutical Society of Great Britain. How nobly the latter performed their part has already been acknowledged by individual members of the Conference and by the Pharmaceutical press, yet I would not omit the present opportunity of again testifying how deeply we are indebted to the Pharmaceutical Society for the timely and generous help afforded in what was really a time of embarrassment and need.

A second subject of congratulation is the fact that we are assembled in the ancient city of Bristol, that place of all others where good pharmacists abound, and where is exhibited the, I fear, solitary instance of a thriving, long-established and growing provincial Pharmaceutical Association. It is much to be regretted that the efforts made in other places to found similar institutions should have so generally failed as regards permanency. As a rule too much has I think been attempted. Provincial schools of pharmacy, except they be in connection with a medical school, cannot be made self-supporting, when the students are drawn—as a rule they must be—from limited areas. Where the attendance of classes can be combined with a reasonable amount of labour in the pharmacy the case is more hopeful, but when this condition cannot be assured, and students in order to obtain systematic teaching are compelled to give up their situations, they will naturally gravitate to the larger centres where circumstances are more favourable, and the course of instruction more complete.

Since our last meeting we have witnessed the inauguration of what bids fair to be a worthy specimen of a provincial association. I refer to that established for the benefit of Wolverhampton and its district. Let us hope that under the guidance of its powerful directory it will succeed in avoiding the shoals upon which not a few of its predecessors, that commenced their voyage with equal promise, have been stranded.

The less ambitious Pharmaceutical Associations very generally find it difficult to maintain the interest of their evening meetings, and provide subjects for discussion. On that point I will venture a suggestion. It is comparatively rarely that I have an opportunity of attending the evening meetings of the Pharmaceutical Society; when I do I find almost invariably the following scene enacted. After the more formal business has been disposed of, the paper or papers of the evening are read, and discussions upon them invited. The invitation is at once responded to by the professors, who, from the fact that they know more about the subject than probably any others present, and from their acquired habit of speaking diffusely, as when addressing students, occupy so large a share of the time at the disposal of the chairman, that before the questions have been half thrashed out, that functionary looks nervously at the clock and, expressing a fear that if gentlemen are detained too long they will not readily put in a second appearance, dismisses the assembly.

My suggestion is this, that instead of insisting on something entirely new, they should more frequently than is now the case take up half-debated questions where the Pharmaceutical Society dropped them, and not leave them to be completed by letters to the editor of the *Journal*, or by furnishing to that periodical a supplementary article. How much better to do this than, confessing one's poverty of resource, to implore the aid of a neighbouring medico, and receive from him well meant but scarcely disinterested advice on how to conduct a pharmacy, or a lecture on a medical subject but remotely connected with the duties of a pharmacist!

Next to associations directly affiliated with pharmacy, must be ranked those that aid it indirectly, by fostering the sciences, or some of them, upon which our art is based. The pharmacists of Yorkshire are to be congratulated upon the establishment of the Yorkshire College of Science, where will be—in fact, are—methodically taught experimental physics and chemistry, both practical and theoretical, by able professors, on moderate terms. Pharmaceutical students who observe the signs of the times will not be slow to avail themselves of such advantages; and should any want reminding, the Honorary Secretary of the College, our late joint Secretary, and—may I hope?—future President, Richard Reynolds, will not fail to do it. Under such auspices the success of the Yorkshire College of Science may be regarded as an accomplished fact, and it may in addition be said that every member of the Conference will feel a personal interest in its prosperity.

An institution of a still more ambitious character has been projected

—as yet it is only a project—for the West of England and South Wales. It is to be called the School of Science and Literature, and will be carried out in connection with certain colleges in the University of Oxford. As its name implies, it is intended to provide for the field embraced in its operations a literary as well as scientific education, the latter being directed especially to the industrial wants of the important manufacturing and mining district of which Bristol may be regarded as the centre. The School will, therefore, bear a close resemblance to Owen's College, Manchester, and be, like a similar institution in Newcastle, connected with one of the Universities. Probably no provincial city equals Bristol in the extent and variety of its museums, libraries, and other aids to mental cultivation; it has, therefore, been rightly selected as the site of the new College. Part of the funds required for the carrying out of the scheme have been promised by Balliol and New Colleges, Oxford, and for the remainder an appeal is being made to the public. In this part of the work pharmacutists will probably not take a prominent part, yet it is satisfactory to find on the list of the Provisional Local Committee the names of our energetic and able *confrères*, Messrs. Stoddart and Schacht, whose efforts in so good a cause we all, and especially the local men, hope to soon see crowned with merited success.

The trustees of the Gilchrist Fund, whose Secretary is Dr. Carpenter, have at their disposal no less than £4,000 per annum, which by the terms of the trust deed, they are bound to devote "to the benefit, advancement, and propagation of education and learning in every part of the world, as circumstances permit." One thousand pounds of it has been placed in the hands of the Royal Society, to be expended in grants to men of proved ability in scientific research, to enable them to prosecute investigations of an expensive character, which without assistance they would not be justified in undertaking. It would be worth consideration whether scientific institutions, such as those I have mentioned, are not justified in asking the trustees to lend a helping hand to them during the few years of struggle that, with the best of management, generally precede success.

The question so often debated at this Conference (introduced originally, I believe, by Mr. S. Atkins, the present Mayor of Salisbury) as to the desirableness of transferring the conduct of the Preliminary Examination from the Board of Examiners to the College of Preceptors has, at last, received its solution. At the April meeting of the Pharmaceutical Council it was decided, by fifteen votes to two, on the motion of Mr. Atherton, "that the

questions for the Preliminary Examination after the present year be prepared and reported on by the College of Preceptors." The Society does not give up its control over this examination, which would not be desirable, but will still continue to issue the questions, direct how, when, and where the examination shall be held, and doubtless interpose should the questions set seem inappropriate.

Early closing has received this year a greater amount of attention than usual, and powerful pens have been enlisted on either side in conducting the controversy.

It would be voted perfectly absurd were one to state the naked proposition that because the occupation of a dispensing chemist is, of all trades, the one that requires the most strict attention to accuracy, the greatest amount of mental effort, and is, consequently, the most exhausting, that therefore the said dispensing chemist should be kept at work for several hours longer than any other tradesman, except, I should explain, the publican. But the latter has some excuse—with him it pays; the chemist, on the other hand, rarely earns after nine o'clock the cost of the gas he burns. How strong an instinct of trade must possess him, and how ridiculous to talk of the "profession" of pharmacy under such circumstances! We are, however, improving in this respect, and London is setting, as it ought, a good example. Thanks to the efforts of a few leading pharmacists, arrangements have very generally been adopted by which the principal establishments are closed at a reasonable hour, varying necessarily somewhat, according to circumstances, but as a rule affording fair opportunities for recreation, and for preparing for the now inevitable examinations. To afford facilities for procuring necessary medicines at any time of the day or night is the duty of a pharmacist; but it is not essential to this that the shop should be kept open, with lights burning and assistants in waiting, inviting apparently what ought to be conceded as a matter of favour rather than right.

At the July meeting of the Pharmaceutical Council Mr. Schacht introduced a subject which seems to me one of extreme interest and importance, as it concerns the teaching of practical pharmaceutical chemistry as distinguished from the mere compounding and retailing of drugs, which ordinarily is the sole occupation of the so-called pharmaceutical chemist. It is quite true, as Mr. Schacht said, that very few students have had the advantage of working in a well-appointed laboratory during their apprenticeship, and therefore the more desirable is it that the opportunity should be afforded them whilst passing through the curriculum at the Square. The rarity

among pharmacutists of laboratories even on the most moderate scale is much to be deplored, and anything that would lead to their multiplication would, I am sure, tend greatly to the improvement of pharmacy and the raising of the status of pharmacists. The difficulty as regards space is often nearly insuperable; but I would remind those really in earnest that a laboratory cannot be too near the roof, and that should there not be space enough immediately under it, that the roof can be raised, as I myself have been compelled to do under the circumstances. But the space having somehow been acquired, how is it to be fitted with suitable apparatus? Your local tradesmen will here be of little use to you. They will be ready enough to execute your orders, and even make suggestions, but you will be fortunate if you get what you want before two or three reconstructions. A good model pharmaceutical laboratory, established at the Square, would be not merely a laboratory for the students to work in, but a museum of pharmaceutical apparatus, where one could see at work every piece of apparatus likely to be required, could judge for himself of its usefulness, obtain information as to its cost, and ascertain where it could be procured.

Manufacturers would be only too glad to send their goods on exhibition to such a place, and the result would, I believe, be found highly beneficial to all parties. I was sorry, therefore, to observe in the report of the last meeting of the Council that the committee, to which the subject was referred, was of opinion that it was not at present advisable to take any step in the matter.

The introduction by Sir Michael Hicks-Beach and the Attorney-General for Ireland of an Irish Pharmacy Bill, framed, I would observe, without consultation with the Pharmaceutical Society—whose interests it seriously affected, and of whose political power these gentlemen seemed quite unaware—has fortunately ended, after an infinite amount of negotiation and agitation, in the establishment of an independent Irish Pharmaceutical Society. Independent, I should observe, as regards ourselves, but most surely dependent on the Apothecaries' Company of Ireland, a contingency which seems not to have troubled our Celtic friends in the least, and need not concern us, except that it will, in all probability, have an injurious, if not destructive influence, on the future value of the title "pharmaceutical chemist," which, after a weak protest from the Pharmaceutical Society of Great Britain, has been conceded to the new society. One may be sure that the apothecaries will not put the examinations too high; in fact it is optional with them whether they have more than one; in which case it must, in order to render the Act in any

way operative, be of the character of our Modified, so as to admit the class of chemists and druggists. Now, no one fears an irruption of Irish pharmacutists; that would be impossible without they first passed both the Preliminary and Minor of the English Society, but this may happen when the title "pharmacist," and its numerous and distracting aliases, become of sufficient value; the English Minor examinee, if sufficiently unscrupulous, may take a trip across St. George's Channel, and there obtain the coveted initials without any further tax on his mental powers. He perhaps may have to add to them the initial I., or the word Ireland. Those skilful in arithmetic may amuse themselves by calculating how long it would take the British public to learn to discriminate between the title with and the title without the I., seeing that up to the present time they have failed to see any distinction between Member of the Pharmaceutical Society and Pharmaceutical Chemist. We have saved our "purse" and lost our chance of some day achieving a "good name."

The fourth International Pharmaceutical Congress, which met at St. Petersburg shortly after our last meeting of Conference, appears not to have quite satisfied the anticipations of Englishmen, who, as a rule, are not distinguished for love of symmetry, method, or completeness, and consequently are unable to share the feeling of those who, like the French, enter with zest into minutiae that would appear to them but trivial and troublesome. It is amusing when reading the report, to observe how tenderly the susceptibilities of the Russian Government are treated. For instance, the question "Ought women to be allowed to practise pharmacy?" was withdrawn from discussion altogether. Another question: "Is it *indispensable* that the chair of pharmacy should be occupied by a pharmacist?" was put in the doubtful form for the same reason, although no one present had the least doubt upon the subject, and resolutions affirming its desirableness were duly voted. The discussion of the limits of the responsibility of the principal and his assistant respectively, issued in the passing of a resolution to the effect that the principal ought to be held liable for the quality of his drugs and preparations, and for all infractions of the law either by himself or his subordinates with his consent. Then commences the exclusive responsibility of the assistant, who is liable in his own person for the mistakes he commits, and of course also for wilful infractions of the law. This seems very fair, but it must be remembered that by the term assistant is not meant an errand boy, advanced to a position at the counter, but a regularly educated and examined student of pharmacy.

The last question is that which has interested us most, and caused,

alas! the most decided feelings of disappointment: "Has the time arrived for the preparation of an International Pharmacopœia?"

The previous Congress of Vienna had somewhat anticipated the answer to be given by requesting the Société de Pharmacie de Paris to prepare a project for the work in question, and accordingly M. Méhu, the French delegate, presented to the Congress a huge manuscript as the result of his labours. This having been remitted to a commission for examination, in due time five propositions were voted; the first of which declared that the time had arrived for the preparation of an International Pharmacopœia; that such pharmacopœia should in no ways suppress national pharmacopœias, but that when new editions of these works were required, the general principles and directions of the International Pharmacopœia should be inserted in them without modification. Mr. Sutton estimates the size of the report when printed at half that of the Codex of 1866. The preparations in the Pharmacopœia proper, numbering over 300, are intended to form the basis of every pharmacopœia, and supersede similar preparations of the same name, and to them may, it seems, be added the special remedies thought necessary by each individual nation. A vast number of these so-called preparations are definite chemical substances, such as acetate of morphia, acetate of potassium, acetate of sodium, etc., etc., which surely do not call for international interference; we are also to have international lard, butter of cacao, and cane sugar, whilst plasters and ointments are inserted by the score, the majority of them being unknown to the British Pharmacopœia. Mr. Sutton was not far out when he stated his opinion "that it would be at least twenty years before the work could be brought to fruition." But that is not what Englishmen expected; they wished, as I believe, that a general agreement should at once be come to as to the strength of a limited number of the more potent remedies, which might, if thought desirable, be introduced into the national pharmacopœias, and until then should be known and recognized as "international" remedies. Thus we should have Tinct. Opii (Int. Ph.), Acid. Hydrocy. Dil. (Int. Ph.), and so on. If such an idea could be carried out there are not a few British pharmacists who would at once arrange a shelf for the international remedies. The principles upon which the Committee recommended that the future pharmacopœia should be constructed are such as will meet with a very general assent. They are as follow:—The use of the Latin language, the decimal system, uniform system of nomenclature, conciseness of description, indication of the minimum of active principles for each poisonous drug, simplicity, as far as

possible, in the composition of galenicals, indication of the maxima of impurities to be tolerated in chemicals.

It may be taken, I presume, as a matter of course that the indication of extreme doses will be made compulsory on the prescriber, as is the case now in Germany and elsewhere. It is much to be regretted that the action taken in the matter by the Conference last year has hitherto been fruitless, much to the annoyance and discomfort of both dispensers and prescribers, and also, it is to be feared, to the danger of patients—not so much of their getting a poisonous dose as of their getting a safe one, and less than the prescriber intended. We must not give up the idea, however, but when the time comes for the revision of the Pharmacopœia, urge it forcibly upon the General Medical Council, and upon the Government if necessary.

Taken as a whole, I fear that the Fourth International Pharmaceutical Congress has, by entering too fully into minutiae, attempting in fact, too much, postponed indefinitely the achievement of the universal pharmacopœia. It still may fall back as a last resource on the amusing proposition of some of its members, and by the fusion of the French and German pharmacopœias hope for a good result!

The numerous *résumés* of the scientific work of the year to be found in various publications, and notably in our own *Year-Book*, render it unnecessary for me to attempt anything like a complete account of work relating to pharmacy; indeed it would be a work of supererogation to indicate another royal road to that branch of knowledge. I shall, therefore, content myself with referring to some few of the more remarkable facts and discoveries that have been brought to light since our last meeting.

It may, I think, with truth be said that we have had during the past year an unusual number of additions made to our list of drugs, and that not a few of them seem destined to take a more permanent place in the practice of medicine than falls to the lot of the great bulk of new remedies, which although vaunted highly by their discoverers or promoters, enjoy, as a rule, but a short-lived popularity, and fail to justify their pretensions to supersede the better known and trusted remedies that have come down to us from the time of Dioscorides.

It is no easy matter for a drug to find its way into a pharmacy, more difficult still for it to achieve the honour of a place in the national pharmacopœia, most difficult of all for it to engage the attention of the ordinary apothecary, and take a place in his list of

"good things." Yet this crowning dignity may with safety be prophesied of jaborandi, salicylic acid, and perhaps some others.

The extended commerce of this country, the possession of numerous colonies, the propensity for foreign travel that characterizes the Englishman, conduce to bring to our markets a greater number probably of new productions, vegetable and mineral, than fall to the lot of the whole world beside.

It is to be feared that not a few of these novelties fail to excite a due degree of attention, are never tested with scientific accuracy, and so fail to achieve the position they deserve. Others, again, fall into the hands of speculators, are puffed inordinately, and, having thus obtained a spurious currency, are finally abandoned as worthless. Condurango is an example that will occur to every one, of a remedy thrust without any justification of merit upon the attention of the medical faculty; raising, it is to be feared, false hopes in the breasts of the afflicted, and causing the loss of valuable time in the treatment of disease.

Were it possible to find a sufficient number of competent physiologists to investigate and report on the action of new remedies as soon as introduced, a vast amount of good might be effected, charlatanry would be exposed, and an end summarily put to the false pretensions of unscrupulous speculators, to whom not even disease is sacred.

It is, I suppose, hopeless to expect to find in the ranks of hard-worked medical men experimenters able and willing to cope with the great amount of this kind of work which may be said to be daily and hourly accumulating. Take such a series of investigations as those of Wright on the Alkaloids, where, in a single page, we may find described perhaps half a dozen bodies of definite composition, distinctive crystalline form, and endowed with potencies differing both in kind and degree each from the others. What proportion of substances such as these are *adequately* tested, how many are not tested at all, possibly to the great loss of medical science! Parliament has more than once voted £2000 to defray the cost of investigating the sources of certain diseases of an infectious character, and it would, I think, not be amiss to ask it to supplement the grant in future years with another £2000 to defray the cost of the physiological testing of new remedies proposed for the treatment of disease generally. The appointment of such a commission would also enable one at once to grapple with that monster evil, the unrestricted sale of the so-called patent medicines. Patent they are not, they are the reverse of it—secret. I would make them in fact

what they are in name; their composition should be divulged to the commission, and some control thereupon exercised upon the publication of advertisements respecting them. It would not, of course, do to endorse puffs of any kind, but the power of preventing the more scandalous and destructive of the lies from being obtruded on one's attention from every hearing and almost every publication should be vested in some one. Care for the public health demands some interference; for example, with the sale of certain hair restorers, which, vaunted as not being dyes, and uninjurious, are found when chemically examined to contain poisonous combinations of lead. Indeed, there is scarcely a chemist or a doctor who could not adduce from his own experience instances of their poisonous action on the persons of their customers or patients. Another glaring instance is that of the "sure cure for the opium habit,"—it was found to contain per dose two grains of sulphate of morphia, to be taken three times a day. I will not pursue the subject further than to suggest the patent medicine question as a hopeful one for any member of parliament in want of a hobby to get astride upon.

Jaborandi, first introduced to the notice of Europeans by Dr. Coutinho, of Pernambuco, deserves certainly the premier place among the new remedies of the year. Rarely has it happened that so much attention has been lavished on a new product, whether of vegetable or mineral origin; this being probably due to the extremely marked character of its action, and the fact that it came opportunely to supply the want long felt of a direct acting and trustworthy sudorific.

Its name, a most barbarous one, is applied in its native country, Brazil, to a class of remedies possessed of sudorific, stimulant, and sialogogue properties, hence the difficulty experienced at first by botanists in determining the true source of the remedy, a difficulty enhanced by the fact that the leaves and twigs, of which the first importations consisted, were not in a satisfactory condition for examination. M. Gubler was, however, enabled to decide at once against their piperaceous origin (though it is certain that that order furnishes some of the plants to which the name jaborandi has been applied), and, assisted by M. Baillon, assigned them to the Rutaceæ—to *Pilocarpus pennatifolius*. Several botanists in this country also carefully examined them, and Mr. Holmes, of the Pharmaceutical Society's Museum, having fortunately obtained fruit-bearing specimens, was enabled authoritatively to state that the plant was rutaceous, and of the genus *Pilocarpus*. As to the species, it was

thought premature to attempt its identification before the receipt of well authenticated specimens of the flowers.

As chemists, we of course have little to do with the physiological action of drugs, except when regarded as an aid, and a very important one it often is, to identification of species or determination of quality, yet one cannot omit referring to Mr. Martindale's bold experiment upon himself, and the interesting account of the result which he sent to the *Pharmaceutical Journal*. The subject has been practically exhausted by the labours of Dr. Ringer in this country and Professor Gubler in France.

The chemists were not slow to perceive nor backward in working the new field of inquiry opened to them. In January, 1875, Parodi communicated to the *Revista Farmaceutica* of the Pharmaceutical Society of the Argentine Republic, the results of his examination of the jaborandi used by the natives of Paraguay. From the leaves and spikes of this plant he succeeded in extracting an alkaloid of feeble basic properties which he, using his right as a discoverer, named jaborandine. It was obtained in prismatic crystals belonging to the rhombic system, and in sufficient state of purity, it seems, to justify its combustion and the adoption of the formula $C_{20}H_{13}N_2O_6$. From the description which he supplies of the plant he used, it is certain that he did not employ true jaborandi, as we understand the term, but a species of *Piper*. It is therefore unfortunate scientifically that he should have chosen for its alkaloid the name he did; on the other hand it is comforting to reflect that in consequence of his mistake our ears will be spared the infliction of a word eminently cacophonous. In March, M. Byasson submitted to treatment a sample of the true drug obtained from the fountain-head, Dr. Coutinho, and obtained therefrom a small quantity of a substance of alkaloidal character, possessing the characteristic activity of the parent drug. He described it as a liquid, viscid, aromatic alkaloid, having an acrid and bitter taste, and capable, like nicotine, of being carried over with water by distillation. He called it jaborandine, but leaving out of the question the prior adoption of that name by Parodi, he was scarcely justified in giving a name at all to a substance so ill-defined and of which he could tell so little, either of its physical or chemical characters.

In May, Mr. Gerrard, indicated a simple method of extracting from jaborandi an alkaloid which, in accordance with Mr. Holmes' advice, he named pilocarpine, and in June he was enabled to announce the crystallization of its nitrate in sufficient quantity for the determination of its more important reactions, and to fix its dose at half

a grain as a medium quantity. Prof. Attfield will I hope be able to give us the rational formula of this substance, derived from combustions, which I understand he has undertaken to perform.

English pharmacists will then have reason to feel proud of the share taken by them in the elucidation of the interesting problems connected with the introduction of jaborandi. Of course there is plenty of room for further experiment. In all probability more than one alkaloid is present, and it might be discovered that the sialogogue and sudorific properties are resident in distinct substances. Should this be the case it would be most fortunate, as the simultaneous production of extreme salivation and perspiration seems to be the *amari aliquid* of the administration of the new drug.

The Brazilian drugs recently presented to the Pharmaceutical Society by Messrs. Cyriax & Farries, and reported on by Mr. Holmes, contain among them several that seem to call for further inquiry and examination on the part of pharmacists. It seems, indeed, that South America, to which we are indebted for some of the most destructive diseases, is endeavouring to balance the account by providing the means of effecting their cure.

The statement respecting butea, "that it contains a basic substance which, combined with sulphuric acid, is white almost like that of cinchona, and is exported to Europe in great quantities to adulterate quinine," deserves to be taken note of, though one part of it seems highly improbable.

Erva de rato, a cinchonaceous plant used in Brazil for killing rats and mice, exerts, it is said, on the heart an action similar to that of digitalis. This statement certainly deserves careful examination; should the action not be identical, probably it is only similar, it might furnish another means of alleviating a class of disease of a peculiarly painful and hitherto intractable character.

To Dr. Fayrer, of Calcutta, is mainly due the introduction to European medical practice of Goa powder, called also Bahia powder and araroba powder, a potent remedy in certain skin diseases—herpes circinatus, chloasma, etc. This, too, has a Brazilian origin, and seems to have been an article of export from Bahia to Goa, when both were Portuguese colonies. Its origin long remained a profound secret, and its employment was confined to those irregular practitioners of medicine whose untrammelled intellects have so often opened a path for the more staid and methodical practitioners of the schools. Dr. J. F. da Silva Lima has traced the substance from its place of production to its place of sale, and made evident the fact that the Goa, Bahia, and araroba powders are one and the same,

and the produce of a leguminous plant growing in Bahia, where several species of it are to be found, all, with characteristic Brazilian indifference, called by the same name, "araroba," or tawny-coloured. Some plants of araroba are now, thanks to Dr. da Silva Lima, growing in the Royal Botanical Gardens of Edinburgh, so that it will not be long before botanists will be able probably to give a complete account of the true source of this interesting remedy. Professor Attfeld, in a paper read before a meeting of the North British Branch of the Pharmaceutical Society of Great Britain, described fully the chemical characters of the pure powder sent to him by Mr. David Kemp, of Bombay, by whom it had been christened, with the view to doing away with troublesome synonyms, chrysarobin. The one remarkable fact connected with a most patient and able analysis is this, that chrysarobin contains from 80 to 84 per cent. of pure chrysophanic acid. This acid, long known as a constituent of rhubarb roots, *Parmelia parietina*, and perhaps also senna leaves, had never been suspected of possessing powers such as now it must be credited with. Should the price of chrysarobin ever become disproportionately high, it will always be possible to revert to its active principle derived from well-known and native sources; but that contingency seems remote, as, according to Dr. da Silva Lima, it is obtainable in Brazil in any reasonable quantity. Possibly its wonderful properties as a dyeing material may eventually be made use of. It is a singular fact, referred to by Mr. Holmes in his paper on the identity of Goa and araroba powders, that dock-root a well-known but poor source of chrysophanic acid, was used in the time of Gerrard for the treatment of certain skin diseases, and Professor Bentley affirms that it is still used in Sweden for scurvy, and in many cutaneous disorders.

Gurjun balsam, a fluid oleoresin, attained by incisions of the bark of *Dipterocarpus laevis*, has until recently been regarded solely as an object of suspicion and a possible adulterant of copaiba. It now is in a fair way of being recognized as a most valuable agent in the treatment of skin diseases, and especially of that most horrible one, leprosy. Dr. Dougall, a medical officer of the Indian government, first conceived the idea of so employing it, and having observed decided mitigation of the worst symptoms of the cases first experimented upon, carried out on an extensive scale a series of trials of the remedy at the Haddo Leprous Hospital, Andaman Islands. In his report to government he gives details of the remarkable results of the treatment, leaving no doubt that the doctor has hit upon a most valuable agent, which renders tractable a most loathsome

disease, that hitherto has defied human efforts at removal, and it may almost be said of alleviation. The balsam emulsed with lime water is given to the extent of twelve drams daily, and at the same time the whole body is anointed with a similar emulsion night and morning. The Indian government attaches so much importance to the discovery, that it has instructed the keeper of medical stores at Calcutta to collect a large supply of the balsam, for distribution wherever competent persons can be found to administer and report upon it. The issue of these reports will be awaited with interest, more especially since the balsam has been found by so trustworthy an observer as Erasmus Wilson to exercise a beneficial influence in the treatment of a disease of equally painful character affecting Her Majesty's European subjects, viz., cancer.

More than fifteen years ago, Kolbe and Lantermann demonstrated the possibility of preparing from carbolic acid the then little esteemed salicylic acid. The process adopted was one suggested by Wanklyn, who in the same year discovered that when carbonic acid was passed into sodium-ethyl, propionate of soda was formed; and similarly when sodium-methyl was used instead of sodium-ethyl, acetate of soda was the result. More recently the reaction has been carefully studied by Kolbe, with the view of procuring the acid at a cheap rate for the economical uses which Professor Kolbe was the first to recognize in it. He imagined that, seeing their easy convertibility, the two acids, carbolic and salicylic, might probably be endowed with similar physiological properties, and that idea he has since fully demonstrated the truth of by experiment. As an antiseptic, salicylic acid is a formidable rival to carbolic acid, preventing and destroying with equal certainty the action of both organized and inorganized ferments. Thus, it destroys the activity of the alcoholic ferment in saccharine fluids, and the ammoniacal ferment in solutions of urea, whilst it equally prevents the decomposing action of emulsin on amygdalin, and of synaptase on myronic acid. Its power as an antiseptic when used instead of carbolic acid for the dressing of wounds, is considered by Mr. Lister to be scarcely equal to that of the latter substance. This inferiority possibly depends on its less volatility, which, whilst offering the advantage of absence of disagreeable smell, entails the disadvantage of limiting seriously its action on the atmosphere surrounding the diseased surface. On this account we may expect that as a general disinfectant carbolic acid will continue to hold its ground; and that notwithstanding its extremely poisonous character, a fact of which we are now and then reminded painfully by the occurrence of loss of life through its accidental administration.

Salicylic acid, on the contrary, is comparatively innocuous, and being a solid does not invite the attention of drinkers and others, too apt to conclude that a carefully hidden bottle must conceal something nice. The antiseptic action of salicylic acid is not shared with its salts, so that when the saturation of the acid accidentally occurs through the evolution of ammonia generated by putrefaction, its utility ceases, or at least is suspended until the addition of an acid sets it free again. Nothing could more forcibly illustrate the non-poisonous nature of salicylic acid, than the fact that it has been recommended to be added in minute quantities to the water in which leeches are preserved. It is said that their mortality is in that way very much lessened. The future of salicylic acid seems to point rather in the direction of internal than external applications. It has been suggested as likely to be a potent remedy in diseases of zymotic character; perhaps its exhibition in conjunction with sulphurous acid, would be more beneficial than when given alone, as the sulphurous acid would not only directly assist it, but by preventing its neutralization, conduce to the permanence of its action. Mr. John Williams, at a recent meeting of the Pharmaceutical Society, exhibited oil of wintergreen (salicylate of methyl) prepared from the artificial acid, and possessing perfectly the taste and odour of the oil yielded by the plant on distillation. The methylic element was probably obtained in the usual way from wood spirit, but it would not have been difficult to prepare this from purely inorganic sources as Berthelot pointed out some years ago.

Salicylic acid is now quoted in the price lists at 8s. per oz. for the natural product; 2s. per oz. for the artificial.

In October, 1871, Dr. Broughton, of Ootacamund, presented to the museum of the Pharmaceutical Society a very pure and interesting specimen of carbolic acid, derived indirectly from the essential oil of *Andromeda Leschenaultii*, a plant that grows in inexhaustible profusion on the Neilgherrie Hills. This oil is nearly identical with that of wintergreen, and consists almost wholly of salicylate of methyl. The production of carbolic acid is effected by first saponifying the oil with potash, then adding a mineral acid which precipitates the salicylic acid in a state of purity, and finally distilling the dry acid with lime and sand. The result is pure carbolic acid which crystallizes at once on reaching the receiver. Dr. Broughton calculates that by pursuing this method, pure carbolic acid could be produced at from five to seven shillings per pound. It is obvious that by dispensing with the last operation, and stopping at salicylic acid, that acid could be rendered at a price considerably less than the figures I have quoted—possibly at 4s. per lb. Here then is a

hopeful source of a cheap and pure supply of this valuable drug. I have written to Dr. Broughton with reference to it, and hope to have in time for this Conference, a note from him respecting it. Dr. de Vrij has also pointed out a new source of oil of wintergreen—*Gaultheria punctata*, a plant growing in great abundance in Java, and yielding on distillation as much as 1.15 per cent. of crude oil. This might possibly be similarly utilized.

Mr. John Williams, who has so often contributed to our transactions, recently read before the Chemical Society an important paper on a physical subject of the highest interest, viz., the graduation of thermometers. The scale adopted by Fahrenheit seems to be purely arbitrary, unless, indeed, he fancied some connection to exist between the interval between the melting and boiling points of water, and the number of degrees in a semicircle. Such an idea would not seem absurd 150 years ago. His assumption that no lower temperature than that caused by mixing ice and salt could be produced, was of course incorrect, and why he numbered 32 degrees between that, his zero, and the melting of ice is not apparent. However, his mode of graduating held its ground until the introduction of the centigrade method, which divided the interval between the boiling and melting points into 100 degrees, and started from the latter point as zero. The division was certainly decimal, if that be an advantage, but beyond that the only real improvement was the establishing the fact that all minus numbers represented degrees below the freezing point of water. On the other hand it entailed the disadvantage of lengthening the degree and necessitating the frequent use of fractional numbers.

It was the consideration of these inconveniences that first induced Mr. Williams to think of a remedy, which he found in taking for his scale the interval between the boiling and freezing points of mercury, and dividing it into 1000 degrees. Hence the name he has given it, the milligrade.

According to Dulong and Petit, mercury boils at 360°C ., and freezes at -39.44°C . The interval is therefore nearly 400°C . Probably this number is quite as accurate as 399.44° —it cannot be supposed that either is absolutely exact. The whole number being adopted, it follows that $2\frac{1}{2}$ degrees milligrade equal 1 degree centigrade. The following curious results are obtained on carrying out the necessary calculations. The freezing point of water is 100°M .; the boiling point, 350°M .; the interval, 250°M ., being just one-fourth of the interval between the freezing and boiling points of

mercury. This last coincidence had not, I believe, been noticed before, but it would, of course, be the same for any graduation whatever. Benzol melts at 100° M., boils at 300° M. Nordhausen sulphuric acid melts at 100° M., boils at 200° M. Bihydrated sulphuric acid melts at 122.5° M., boils at 622.5° M., the interval being exactly 500° M.

Many of the volatile metallic chlorides, such as those of arsenic, antimony, etc., have intervals between their melting and boiling points which appear to have some simple relation to the interval between the melting and boiling points of mercury. However its chief merit is practical utility, independent of all theoretic considerations, —the shortening of the degree, thereby lessening the frequency of the employment of fractional numbers, and the abolition for all temperatures above that of the freezing point of mercury, of minus numbers. It would be too sanguine to expect the milligrade to supersede the centigrade in our day, but that there is much merit in the conception and much of interest in the results cannot be questioned.

M. Nativelle, who discovered in 1872 a method of preparing from the leaves of *Digitalis purpurea* a crystalline substance possessing the physiological properties of the plant, and which he named digitalin, has had a hard time of it lately in the defence of his position. In the April number of the *Journ. de Pharm. et de Chim.*, he repels the attack of M. Kossmann who had re-asserted his belief that the true active principle of foxglove is an amorphous body, and affirmed that M. Nativelle's digitalin was a product of change, such as might take place, such is the instability of the true digitalin, either inside or outside the plant. To attempt to give even an outline of the results described by Nativelle, Kossmann, Homolle, Walz, and Schmiederberg would occupy much longer time than I could devote to this subject. Probably not less than a dozen definite principles, if one could believe their discoverers, would have to be examined. Certain it is one could not find *digits* enough to count them upon, and moreover the greater number of them seem possessed of toxic properties. Schmiederberg's last announcement, digitoxin, is so poisonous that he doubts whether it is fit for medicinal use. It moreover is completely insoluble in water, in that respect agreeing with the digitalin of Nativelle, which Schmiederberg declares to be a mixture of digitoxin and paradigitogenin. Anyhow Nativelle was the first to produce and exhibit a crystalline principle derived from foxglove, and representing with tolerable exactness its physiological action, and while such can be obtained of

constant composition and definite form, that assuredly is the article that ought to be employed, and not an amorphous substance possessing no definite characters by which it might be recognized. Doubtless the more complex of the vegetable alkaloids are extremely prone to alteration, and until we know more of the true constitution of that class of bodies, it will be useless to attempt to decide as to which is the mother substance of such series as are met with in foxglove, aconite, or cinchona. This Conference has already made a money vote towards the elucidation of the aconite mystery, and will probably be asked for a second grant, but it would, in my humble opinion, be more usefully devoted to the determination of the exact chemical position occupied by one or two of the more stable alkaloids. It doubtless is very interesting to ring the changes upon such a substance as morphia, but this might go on for ever, and I have failed to perceive that up to this time any consensus of opinion has been arrived at, on what may be termed the previous question,—what is an alkaloid?

It would not be difficult to extend this imperfect notice of the science of the year to a great length, but experience warns us not to devote too much time to the preliminaries of our Conference. I had intended giving a *résumé* of the very interesting controversy on the question of ferments, of which the last word was spoken by Pasteur, in April of this year. The debate was sustained during a number of years by such men as Pasteur, the author of the modern theory of ferments; Fremy, his chief, and not altogether ingenuous, opponent; Dumas, Liebig, Berthelot, Bechamp, Lechartier, and Bellamy, and therefore could not fail to be instructive. But the mass of materials collected could not be reduced within such limits as to allow for the introduction of other subjects of more immediate importance.

I, therefore, reluctantly pass on to the least agreeable part of my task, the record of the loss we have sustained by death during the year. And that loss, I refer to that of one only, is truly enormous, and I fear irreparable. In the later numbers of the issue of the *Pharm. Journ.* (of March 27), appeared a short announcement of the death of Daniel Hanbury, and such was the reluctance to believe news so disastrous, that it was, I believe, very generally discredited as too bad to be true. Such, however, was the fact. Daniel Hanbury, *facile princeps* of British pharmacologists, had died on the 24th, of typhoid fever, in the prime of life, the very plenitude of his powers, and height of usefulness. His friends had looked forward confidently to the time, assuredly, as they thought, not far distant, when he would be acknowledged as the chief authority on

drugs in Europe, but that was not to be. The fatal hour had struck, he had joined the ranks of "those other living called the dead," and as if to show the vanity of earthly things, the vast stores of knowledge which his active mind had accumulated were at once lost to his friends and the world. It was this sense of loss, a selfish one I admit, that at first overbore every other feeling. One could not help asking the question, To what purpose is this waste? Who is there left to whom the perplexed student can appeal with certainty of a courteous reply, and an indication where recondite information is to be found? The marvellous knowledge of books he possessed and his methodical way of conducting his reading of them, made his friendship, in that respect, invaluable. Able and willing as he was to communicate information, he was not above taking the opinion of those he considered better informed on special subjects than himself. The consciousness of power did not inflate his vanity; he was to the last, when Fellow of the Royal and Linnean Societies, as accessible as when he worked as a student in the laboratory of the Pharmaceutical Society. The scientific journals of this country, and especially those of the Pharmaceutical and Linnean Societies, contain abundant evidence of his painstaking assiduity and conscientious use of mental powers of a high order. Most fortunately for us and for his own fame, he had in the previous year, in conjunction with his friend, Professor Flückiger, completed the "Pharmacographia," which will ever remain a worthy monument to his memory. Without wishing to detract in any way from the merit of his collaborator, it is evident that the work was very greatly indebted to Mr. Hanbury's researches, and especially to the correspondence he had established in all parts of the world, and by means of which he had succeeded in solving so many pharmacological mysteries. Not a few young men now occupying positions of importance owe their success in life to his kindly help and wise counsel; but these cases though not rare, were rarely heard of. In his acts of charity he observed strictly the injunction—let not thy left hand know what thy right hand doeth.

As President of this Conference, Mr. Hanbury achieved a success that will not again in all probability be equalled. As a contributor to its proceedings, and to the discussions arising therefrom, his aid was invaluable. In the latter capacity he was unrivalled, as he could generally manage in a few well chosen words, and those not hastily put forward, either to give himself or elicit from others the information that seemed wanting to complete the knowledge of the subject before the meeting.

His work as a member of the Pharmaceutical Council and as an examiner I need not refer to here, except in order to express a hope that his services will secure him a place in the Walhalla of pharmaceutical worthies by the side of his predecessor, William Allen.

At the conclusion of this address, Mr. C. BOORNE said: We have all listened with deep interest to the address which our President has just read to us. It is one full of useful information, and it shows a large amount of scientific research. There is a point touched upon in the address which I should like to refer to, the importance of it was impressed upon me as a young man by an incident which occurred in my apprenticeship. I am referring to what the President said about prescriptions of extreme doses. When I was an apprentice I was required to dispense prescriptions, and those of some careless prescribers. One day I was called upon to dispense three drachms of potassio-tartrate of antimony, and on reference to the prescriber, it turned out that it should be the liquor. Some time afterwards, while yet a raw recruit, I was left in charge of a business while the master took an excursion into the country. I remember being called up at three o'clock one morning, when a prescription was brought to me to dispense. It included three grains of hydrochlorate of morphia. I felt great difficulty about it. The prescription was brought to me by a gentleman's servant; he could tell me nothing more than that his master was ill; he could not tell me who wrote the prescription. After some consideration I did what I do not mean to justify, I put in two grains. I went to bed, but not to sleep, with lively apprehensions of a coroner's inquest; for I might have killed the gentleman by giving him too much, or I might have defeated an effort to save his life by not giving him enough. I afterwards learned that the medical man intended it to be three grains, because it happened to be a case of delirium tremens. If there had been opposite to the doubtful line a note of admiration, or something to indicate that the apparently extreme dose of three grains was really meant, it would have been a great relief to my own mind as a young dispenser. In the absence of any such assurance the pharmacist is often placed on the horns of a dilemma. I move a vote of thanks to the President for his able and interesting address.

Mr. YOUNG seconded the motion, and said they were all indebted to Mr. Groves for the admirable *résumé* of various matters embodied in his address. It was no easy matter to treat the topics of the year with such freshness as to command the attention of such a meeting as the Conference. There was something sad and mys-

terious in the fact that many of them whose hairs were grey should be called upon to listen to an elegy on their deceased friend Daniel Hanbury. The president was well fitted to do justice to his memory, and they had been gratified by the way in which he had described their deceased friend's character.

Mr. STODDART put the question, and the vote of thanks to the president was carried with acclamation.

The PRESIDENT responded, and said he was very much obliged for the appreciation of his efforts to interest the members of the Conference.

Mr. HILLS rose to offer a word of explanation in reference to a subject touched upon by the President, viz., the papers which were read at evening meetings of the Pharmaceutical Society. He admitted the Society might not have secured so many good papers as those read at the Conference; but that was the fault of the friends who did not offer such papers to the Society. As President of the Pharmaceutical Society for the year, he should be happy to receive a paper from every gentleman in the room; and he would promise not to look at the clock in the manner described by the President. There was, however, this to be said, the really true scientific man was very exact; he must have exact observation; and unless they had that they would never get through their work. Although he had not given many papers to the Pharmaceutical Society, he had set a good example in one respect—he had missed only four meetings in thirty-three or thirty-four years, and he had gained a great deal of information. He never was influenced in going or stopping away by any consideration as to whether the paper would be good or bad. He always got information; and he recommended his friends to go to every meeting, and, if possible, to emulate the local associations which were doing so well. With reference to the Irish Pharmacy Act, he wished to explain that the Council did all they could; but this world, as they all knew, was made up of compromises, and none could have their own way entirely. They were told at first that the Bill should be carried as it was introduced with reciprocity and everything of the kind. The Chief Secretary for Ireland told them he meant to carry the Bill as it stood. The Council knew the Government was strong, but the deputation went direct from the Chief Secretary for Ireland to the lobby, and told members of the House of Commons, and even some members of the Government, that the Bill could not be allowed to pass with the reciprocity clause in it. The result was, that clause was withdrawn at once. He did not think the measure would make much dif-

ference; the pharmacists of Ireland would never interfere with those of England. He was glad that the question was settled. Fearing, however, that the President's words would leave an impression that the Council had not done all they ought to have done, he desired to assure the Conference that all was done that it was possible for them to do.

Professor ATTFIELD said the President of the Pharmaceutical Society would be glad to hear that a member of the Conference had promised to contribute a paper at the Society's evening meeting in December. He would also be glad to know that an examination of the journals for the past twenty years showed that since the establishment of this Conference the original contributions to the other societies had trebled in number, and the journals of pharmacy had been supplied to four times the extent they were fifteen years ago. And yet the Conference had a yearly increasing number of papers to discuss. These facts showed that the Conference acted only as a healthy stimulus to the other pharmaceutical bodies.

After the President's address, the reading of papers was proceeded with.

The first paper read was:—

LINIMENTUM TEREBINTHINÆ ACETICUM.

By W. SYMONS, F.C.S.

During the last meeting of the Pharmaceutical Conference, in a discussion on oleic acid, Professor Redwood is reported to have said, after speaking of the unsatisfactory character of liniments generally, "I have made several experiments with a view to get a more homogeneous liniment than liniment of turpentine with acetic acid, a preparation containing ingredients which separate immediately, and which cannot be kept united."—*Vide Year-Book*, 1874, 537.

On reading this, and remembering the fact which I had noticed, that any oil soluble in spirit vastly facilitates the mutual solution of turpentine and rectified spirit, I was induced to try the following mixture:—

Glacial Acetic Acid	.	.	.	.	.	1 part.
Spirit of Camphor	.	.	.	.	.	2 „
Castor Oil	.	.	.	.	.	1 „
Turpentine	.	.	.	.	.	2 „

When mixed in this order, the above make a perfectly clear and stable solution.

The following will also do the same :—

Liniment Camphor	2 parts.
Castor Oil	2 "
Turpentine	2 "
Glacial Acetic Acid	1 "

Probably in either case the proportions may be conveniently modified. Cajuput and other oils soluble in spirit may also be mixed or substituted for castor oil, but some oil soluble in rectified spirit seems essential as a blending medium, and the same principle may perhaps be applied to some other liniments, and thus fulfil the conditions wished for by Professor Redwood.

The PRESIDENT said papers like this were very interesting in this respect; they offered suggestions to the compilers of the next Pharmacopœia.

PROFESSOR REDWOOD said he had been afforded an opportunity of trying the formulæ suggested by Mr. Symons for making this previously unsatisfactory liniment—that is, unsatisfactory as ordered in the Pharmacopœia—and he considered the method proposed successful. Mr. Symons had very satisfactorily answered the question he undertook to investigate, viz., the best mode of blending the ingredients which are ordered in this formula. In so doing he had rendered an important service. One of the first duties of the pharmacist, and one which was comprised in the objects of the Conference, was to co-operate with the physician in devising the best means of applying remedies in certain cases, where the physician might be able to indicate what the active agent was that he desired to administer and apply, but where he lacked that practical experience that alone could enable him to indicate the best mode of applying it. He (Professor Redwood) was very glad that one of their members had undertaken the investigation of a subject which many, perhaps, might be disposed to eschew and consider an unimportant one. The mere question of the preparation of a liniment did not present to many very strong attractions; there was not room in it for the acquirement of any great credit in the way of discovery; but he considered, nevertheless, that it was possible to confer very great benefit upon medicine by giving attention to subjects of this description. Many of the diseases in which these external applications were used were of the most painful and distressing character, and the alleviation of suffering often depended in a high degree upon the manner in which certain remedies were

put together and rendered suitable for application. A case came under his own observation many years ago in which a friend, a medical man, suffered intense torture from a skin disease, and after trying all the remedies suggested by the most eminent medical men, he at last derived the greatest relief from the application of a remedy supplied to him by an old woman. It was a secret in the hands of the individual who had recommended it; a portion of it was submitted to him for examination, and the best he could make of it was that it consisted of an ointment, and by some, perhaps, despised and rejected remedy,—the old *ceratum saponis*, which had been rejected from the Pharmacopœia on account of the apparently unscientific character of the formula. The result satisfied him that for remedies of that description they were not always to look too strictly to the scientific correctness of the combinations resorted to. In cases of this description, what they, as pharmacists, had to consider was how they could produce an efficient and permanent combination of agents which the medical man wished to apply; they would then have done their duty, and must leave it to the medical authority to determine how far the result fulfilled his expectations. In this case the blending of the ingredients had been most successfully effected.

Professor Attfield then gave a brief summary of the following :—

REPORT ON THE CHEMISTRY OF THE ACONITE ALKALOIDS.

By C. R. ALDER WRIGHT, D.Sc. LOND.

The following materials for investigation were received from T. B. Groves, Esq. (Weymouth), prepared as described by him in former reports :—

A. Hydrochloride of new base believed by Mr. Groves to be identical with the “atisine” of Broughton, obtained from *Aconitum napellus* (Year-Book, 1874, 507) by exhausting the roots with alcoholic hydrochloric acid, evaporating, treating with ammonia and ether, conversion of dissolved bases into nitrates by addition of nitric acid and crystallization, and addition of ammonia and hydrochloric acid to the mother liquors, and evaporation, whereby the crude hydrochloride separated at a certain state of concentration; this hydrochloride was then recrystallized several times from water.

B. Impure “aconitine” nitrate from *Aconitum napellus* (the mixed crystallized nitrates obtained as above).

C. Purified “aconitine” nitrate from *Aconitum napellus*; the crystalline nitrate prepared as above from another batch of roots, and

purified by the mercuric iodide process (conversion into iodo-mercurate, decomposition by sulphuretted hydrogen whilst in alcoholic solution, filtration, removal of iodine by lead acetate, and extraction of alkaloid by ammonia and ether, after evaporation to small bulk).

D. "Pseudoaconitine" from *Aconitum ferox*? (Nepaul aconite, *Year-Book*, 1873, 500) obtained by exhausting the roots with alcoholic hydrochloric acid, evaporation, addition of ammonia and ether, and crystallization by spontaneous evaporation from the ethereal liquid to which alcohol had been added; the crystals were drained, and squeezed in a screw-press, and then recrystallized twice from alcohol.

E. Purified "pseudoaconitine;" a sample prepared (from a different batch of roots) as specimen D, and put through the mercuric iodide process.

F. "Amorphous pseudoaconitine:" the non-crystalline mixture of bases obtained from the mother liquors of D by spontaneous evaporation of the alcoholic liquor acidified with nitric acid, whereby no crystals formed, precipitation by ammonia, and washing and pressing the amorphous precipitate.

Specimen A. — The substance received appeared homogeneous under the microscope, and did not alter in composition by two recrystallizations from water; it did not produce any prickly sensation of the tongue after being cautiously tasted, but had a bitter taste. The following numbers were obtained:—

Sample (1) Air dry crystals as received.

" (2) " " another sample.

" (3) " " recrystallized from water, drained, and dried in the air.

" (4) " " recrystallized twice from water, drained, and dried in the air.

	Per cent.
Sample (1) 0.6190 gram lost at 100° 0.0295 gram = 4.77	
" (2) 0.4725 " " 0.0230 " = 4.87	
" (3) 0.5260 " " 0.0190 " = 3.61	
" (4) 0.9190 " " 0.0380 " = 4.13	
Mean . . .	4.34

Calculated for $C_{31}H_{45}N O_{10}$, H Cl, $1\frac{1}{2} H_2 O$ 4.13

Sample (1) 0.2680 gram of dry substance gave—

	0.5755 $C O_2$ and 0.1850 $H_2 O$
	0.1000 Ag Cl
" (4) 0.3520 " "	0.7555 $C O_2$ and 0.2400 $H_2 O$
0.3320 " "	0.0750 Ag Cl
0.5050 " "	0.1110 "
0.4790 " "	0.0735 Pt

	Calculated.			Found.	
	$C_{30}H_{45}NO_{10}, HCl$	$C_{31}H_{45}NO_{10}, HCl$	$C_{30}H_{43}NO_{10}, HCl$	(1)	(4)
Carbon .	58.49	59.25	58.68	58.56	58.53
Hydrogen .	7.47	7.33	7.17	7.67	7.58
Chlorine .	5.77	5.66	5.79	5.51	5.59 5.44
Nitrogen .	2.27	2.23	2.28		2.18

These two samples were dissolved in water, and converted into gold salts by addition of gold chloride; in each case a flocculent amorphous precipitate was thus thrown down, which appeared to have a slight tendency to darken at the edges by exposure to light; the precipitates were, therefore, quickly filtered off, thoroughly washed, and dried over sulphuric acid in the dark. No apparent alteration was produced by heating the substances thus dried to 100° , but a slight loss in weight to the extent of a few tenths per cent. was thus occasioned, whence it is not impossible that a little decomposition was thus produced; after two or three hours at 100° , however, a perfectly constant weight was attained, whence it is more probable that the trifling loss was due to hygroscopic moisture energetically retained at the ordinary temperature.

Sample (1) 0.6790 grams dried at 100° till constant gave—

		0.1430	Au = 21.06
„	(4) 1.1170	0.2380	= 21.30
„	„ 0.6995	0.1475	= 21.09

Mean . . . 21.15

Per cent.

Calculated for	$C_{30}H_{45}NO_{10}, HCl, AuCl_3$	Au = 21.35
„	„ $C_{31}H_{45}NO_{10}, HCl, AuCl_3$	„ = 21.07
„	„ $C_{30}H_{43}NO_{10}, HCl, AuCl_3$	„ = 21.39

Attempts to form a platinum salt were not very successful, owing to the solubility of this salt in water, and especially in dilute alcohol; a specimen was obtained, of which—

0.3515 gram dried at 100° till constant gave—

0.0470 Pt = 13.37 per cent.

the lowest of the above formula—

$(C_{30}H_{43}NO_{10}, HCl)_2 PtCl_4 = 12.55$ „

Whilst the others require lower percentages still; probably, therefore, this specimen was not wholly freed from excess of $PtCl_4$, as but little washing could be given owing to its solubility.

When treated with ammonia and ether, the hydrochloride yielded a solution of free base which persistently refused to crystallize; nothing but varnishes could be obtained by spontaneous evaporation

of the ethereal or alcoholic solutions, or of mixtures of the two; on bringing a drop of dilute nitric or hydrochloric acid in contact with the varnish, a well crystallized salt was instantly formed. The powdered varnish did not fuse at 100° , but long continued exposure to that temperature caused it to become slightly yellowish.

0.2460 gram dried at 100° till constant gave—

0.5675 C O₂ and 0.1745 H₂ O.

Calculated.

	C ₃₀ H ₄₅ N O ₁₀	C ₃₁ H ₄₅ N O ₁₀	C ₃₀ H ₄₃ N O ₁₀	Found.
Carbon . . .	62.18	62.95	62.39	62.91
Hydrogen . . .	7.77	7.61	7.45	7.88

From the above numbers it is evident that the formula C₃₁H₄₅N O₁₀ is the one which most nearly represents this new aconite base, although the formulæ C₃₁H₄₅N O₁₀ and C₃₀H₄₃N O₁₀ also closely agree with the numbers obtained. Manifestly, therefore, this instance is not identical with Broughton's "atisine," which yielded numbers agreeing with the formula C₄₆H₇₄N₂O₅; moreover atisine (*Medical Press and Circular*, May 27, 1874) melted at 85° , formed crystalline salts only with difficulty, and yielded a platinum salt pretty readily. According to the observations of Mr. Groves, this new base (referred to hereafter as "*base A*," no name being given to it until its history is more fully made out) is far less toxic than aconitine, producing no prickling of the tongue but having only a bitter taste and being almost inert. Comparative physiological experiments on the substance and the other aconite alkaloids are contemplated when sufficient amounts of undoubtedly pure materials are obtained.

Specimens B and C. The crystallized nitrate B (about $1\frac{1}{2}$ ounce) was recrystallized three times from water, whereby its bulk was diminished to about one third; the crystals finally obtained gave with ether and ammonia a solution which dried up to a varnish containing here and there a few crystalline points; on thinning with alcohol or ether, however, no increase in size of these minute crystals took place, from whence it would seem that "aconitine" (which crystallizes readily from ether) could not have been present in any large quantity.

The mother liquors of these crystals were precipitated by sodium carbonate, and the precipitate dissolved in ether, and allowed to crystallize by spontaneous evaporation; in this way, distinct crystals and a viscid non-crystalline mass separated. The whole was from time to time thinned with ether, and when no visible increase in the amount of crystals took place, the whole was filtered by the aid of a pump; the crystals were slightly washed with ether, and recrystal-

lized from that menstruum. The same process was repeated, only small quantities of non-crystalline matters being thus separated by the second treatment and only traces by the third; the ethereal solutions of the second and third treatment readily crystallized by spontaneous evaporation.

The mother liquors of these different crystallizations were united, and evaporated to dryness; the bases left were converted into hydrochlorides, and crystallized. In this way a quantity of material was obtained, consisting apparently almost wholly of the hydrochloride A mixed with a little of the hydrochloride of the crystalline base ("aconitine"), as it had a very bitter taste, but subsequently produced a sensation of prickling of the tongue to a small extent. The yield of recrystallized "aconitine" thus obtained was not much above 6 or 8 per cent. of the mixed nitrates used; the crystals were anhydrous, and energetically produced the prickling of the tongue considered to be characteristic of "aconitine." The following numbers were obtained:—

(I.) 0.2970 gram of substance dried at 100° gave 0.6850 CO_2 and 0.1990 H_2O .

The amount of substance thus obtained in a pure state was not sufficient to enable a complete investigation to be made, and especially to see if any changes in composition were induced by treatment by the mercuric iodide process. The following numbers were, however, obtained with the crystallized base obtained from specimen C by agitating its solution with ammonia and ether, and spontaneous evaporation of the ethereal liquid.

(II.) 0.2270 gram gave 0.5235 CO_2 and 0.1480 H_2O .

(III.) 0.2975 gram gave 0.6845 CO_2 and 0.1955 H_2O .

	Calculated.			Found.		
	$\text{C}_{32}\text{H}_{45}\text{NO}_{11}$	$\text{C}_{32}\text{H}_{43}\text{NO}_{11}$	$\text{C}_{33}\text{H}_{43}\text{NO}_{10}$	I.	II.	III.
Carbon . .	62.76	62.24	63.89	62.90	62.90	62.75
Hydrogen . .	7.13	6.97	7.16	7.45	7.24	7.30

These numbers apparently indicate that "aconitine" contains somewhat less hydrogen in proportion to the carbon than the new "base A;" the numbers obtained with the gold salts from specimens B and C below, however, show that the molecular weight of "aconitine" is perceptibly higher than that of "base A."

The hydrochloride from specimen B was readily crystallizable, and apparently somewhat more soluble in water than that of "base A;" moreover, it contains just twice as much water of crystallization ($3\text{H}_2\text{O}$, as against $1\frac{1}{2}\text{H}_2\text{O}$).

0.5140 gram of air-dry salt lost at 100° 0.039 gram = 7.59 per cent.

Calculated for $C_{33}H_{45}NO_{11}$, HCl, $3H_2O$ = 7.48 per cent.

0.4750 gram of dry salt gave 0.0995 AgCl; Cl = 5.18 per cent.

Calculated for $C_{33}H_{45}NO_{11}$, HCl Cl = 5.32 per cent.

$C_{32}H_{43}NO_{11}$, HCl Cl = 5.43 " "

$C_{32}H_{43}NO_{10}$, HCl Cl = 5.55 " "

0.7380 gram of gold salt from specimen B gave 0.1500 Au.

0.5795 gram of gold salt from specimen C gave 0.1200 Au.

	Calculated.			Found.	
	$C_{33}H_{45}NO_{11}$, HCl, AuCl ₃	$C_{32}H_{43}NO_{11}$, HCl, AuCl ₃	$C_{32}H_{43}NO_{10}$, HCl, AuCl ₃	B.	C.
Gold .	20.21	20.50	20.85	20.32	20.71

From these numbers it seems that whilst the formula $C_{33}H_{45}NO_{11}$ most nearly represents the composition of the crystalline base from specimen B, that from specimen C has apparently a somewhat lower molecular weight, a formula intermediate between $C_{32}H_{43}NO_{11}$ and $C_{32}H_{43}NO_{10}$, representing the composition as deduced from the combustions of the free base and the determination of the gold in the gold salt. Owing to the minute amount of substance received, however (less than one gram of nitrate), it was impossible to examine sample C more thoroughly, and it must therefore be at present left an open question as to whether the crystalline base known as "aconitine," isolated by the method above described, is really altered by being subjected to the mercuric iodide process or not; that such alteration may take place is rendered probable by the results obtained with pseudaconitine (*infra*) as well as by the above numbers. It may be here noticed that Duquesnel obtained from *Aconitum napellus* a crystalline alkaloid which he regarded as "aconitine," and which gave numbers agreeing with the formula $C_{27}H_{40}NO_{10}$ (*Comptes Rendus*, lxxiii., 207) after crystallization from ether, or a mixture of ether and petroleum spirit. Duquesnel's mode of extraction, however, was somewhat different from that of Groves, an alcoholic solution of tartaric acid being used in lieu of alcoholic hydrochloric acid, and the evaporation of the alcohol being conducted at a temperature not exceeding 60° . The question is thus introduced, does the mode of extraction adopted by Mr. Groves influence the result? This, and the numerous other questions arising as to the homogeneity and constitution of the crystalline products above described, can only be decided by further experiments with much larger quantities of material.

One thing is, however, clearly demonstrated—viz., that either

through the natural presence in *Aconitum napellus* of more than one alkaloid forming well-crystallized salts, or through changes produced in the alkaloid originally present by the methods of extraction adopted, the crystallized "aconitine nitrate" thence obtained is liable to consist of a mixture of at least two distinct salts, one of which, if not absolutely inert, is very much less active than the other. Whether these two substances pre-exist in the roots, are transformation products of some other substance, or are related so that one is produced by the decomposition of the other, etc., can only be decided by further research.

Specimens D and E. The crystals of "pseudaconitine," specimen D, received (already recrystallized twice from alcohol) were dissolved in a large bulk of a mixture of alcohol and ether, and set aside for slow crystallization; and in this way two successive crops were obtained, which gave the following numbers:—

1st Crop. Under the microscope only one kind of crystal was discernible, but the great majority was only indistinctly crystalline 0.3165 gram, dried at 100°, gave 0.7410 C O₂ and 0.2180 H₂ O.

2nd Crop. Precisely resembled the first.

0.2925 gram gave 0.6805 C O₂ and 0.1970 H₂ O.

Calculated.				Found.	
				1st Crop.	2nd Crop.
C ₃₆	. . .	432	. . .	64.38	
H ₄₉	. . .	49	. . .	63.84	63.45
N	. . .	14	. . .	7.65	7.48
O ₁₁	. . .	176	. . .		
<hr/>				<hr/>	
C ₃₆ H ₄₉	11	671	100.00		
<hr/>				<hr/>	

The gold salts from these crystals much resembled those from "aconitine" and the new alkaloid.

1st Crop. 0.8090 gram, dried at 100°, gave—

0.1575 Au = 19.46 per cent.

2nd " 1.3260 gram, dried at 100°, gave—

0.2565 Au = 19.34 "

Mean 19.40

Calculated for C₃₆ H₄₉ N O₁₁, H Cl, Au Cl₃ Au = 19.40 "

On dissolving these crystals in acids, salts were obtained which wholly refused to crystallize by spontaneous evaporation in the air, or over sulphuric acid.

These two crops of crystals were mixed and put through the mercuric iodide process: the ethereal solutions of base ultimately

obtained, deposited crystals much resembling the original ones in appearance, and mostly appearing without any distinct shape under the microscope; forms, however, being well crystallized. Of these—

(I.) 0.3105 gram gave 0.7205 C O₂ and 0.2100 H₂ O.

0.7170 „ of gold salt gave 0.1425 gram Au.

The alcoholic mother liquors of the first and second crops of crystals were evaporated to dryness, and the residue put through the mercuric iodide process. The final product was an ethereal solution of base, which did not crystallize at all in well-defined forms, but dried up to a crystalline crust.

(II.) 0.3200 gram gave 0.7300 C O₂ and 0.2160 H₂ O.

0.6410 „ of gold salt gave 0.1320 Au.

Specimen E weighed only about 0.6 gram, and was magnificently crystalline, differing wholly in appearance from all four of the products just described as obtained from specimen D, being made up of minute, well-defined rhombohedra. Unfortunately this specimen was examined before the results just described were obtained, and was wholly used up in two combustions, wherefore no gold salt determination was made. From the results of these combustions it appeared probable at the time that this “pseudaconitine” and “aconitine” (specimen C) were isomeric—a conclusion by no means borne out by the results subsequently obtained as above described.

(III.) 0.3540 gram gave 0.8140 C O₂ and 0.2410 H₂ O.

(IV.) 0.3195 „ „ 0.7365 C O₂ and 0.2200 H₂ O.

From Specimen D, by mercury iodide process.

Specimen E.

	I.	II.	III.	IV.
Carbon	63.27	62.21	62.71	62.87
Hydrogen	7.51	7.50	7.57	7.65
Gold in Au salt .	19.87	20.59		

From the foregoing numbers it results that “pseudaconitine” has a composition different from that of either “aconitine” or “base A,” being indicated by the formula C₃₆ H₄₉ O₁₁; apparently this substance is altered by the mercuric iodide process, its molecular weight thereby becoming lowered, and the percentage of carbon diminishing. With one sample of roots the product of the mercuric iodide process was magnificently crystalline (E); with another (D), the product thus obtained was no better crystallized than the original substance which for the most part only crystallized indistinctly.

As with “aconitine,” further experiment is essential before it can be decided whether these different results are due to difference in the alkaloids contained in the roots, or to alterations in the base or bases originally present during the process of extraction.

No crystalline salts were obtainable from the different specimens obtained as above after employing the mercuric iodide process; this circumstance clearly shows that "pseudaconitine" differs considerably from both "aconitine" and base A, but whether it is a decomposition product of the same substance that yields the others, an alteration product or parent substance of the others, or is really in no way related to them, must be left to future experiment to decide, as must also the relations of these substances to napelline, acolyctine, lycoctonine, and the other more or less amorphous alkaloids examined by other chemists.

Duquesnel views "aconitine" as a glucoside. The amount of "aconitine" from specimens B and C was too small to allow of experiments being made on this point; but the following suggestive results were arrived at with the pseudaconitine product from the mercuric iodide process on specimen D marked (I) above. The base was dissolved in hydrochloric acid, precipitated by a scarcely perceptible excess of ammonia, filtered and washed, and then suspended in distilled water with a few per cents. of its weight of emulsin rubbed up with water to a paste (the activity of the emulsin being proved by leaving a little of it in contact with solution of pure cane sugar, which in a day or two was converted into glucose); in a week an odour of sour beer began to develop, and a soluble salt of an alkaloid began to form; this action went on increasing for two or three weeks, at the end of which time a considerable proportion of the precipitate was dissolved. Ammonia gave a pretty copious precipitate with the filtered aqueous liquid, which also gave a decided reddish coloration to ferric chloride; no trace of glucose could, however, be detected in the liquid at any time during the whole course of the experiment by the copper test. It is hoped that the examination of a larger quantity of substance in this way may lead to some information as to the nature of the fermentative changes undergone by the aconite alkaloids. Attempts to obtain glucose from specimen F ("amorphous aconitine") by boiling for periods varying from half an hour to several days with dilute sulphuric acid proved equally unsuccessful.

The PRESIDENT said Dr. Wright had been working hard during the last twelve months in a field of inquiry in which nearly all seemed to be chaos. These alkaloids were so alterable by air and water that they changed rapidly under the eye whilst one was working with them. It seemed questionable whether it was worth while to

pursue the matter further. But the Conference was greatly indebted to Dr. Wright for the labour he had bestowed upon the subject.

The next paper read was entitled

PHARMACEUTICAL EXPERIMENTS ON THE BRISTOL ROCKS.

BY W. W. STODDART, F.C.S., F.G.S.

Many will probably remember that some time ago I published in the *Journal* a short account of the medicinal plants found in the vicinity of Bristol. On extending my observations to the inorganic substances of the *materia medica*, I found the results equally interesting, and with your permission will bring before your notice a few notes on the pharmacopœial metals which are to be found in our neighbourhood. We can furnish good specimens of fifteen out of the twenty-three metals mentioned in the B.P. For some time past I have made experiments on the natural ores, and from them have made several of our official preparations.

Most of our youths have no opportunity of being in a well appointed pharmaceutical laboratory, and of making themselves acquainted with that branch of practical pharmacy. It is therefore as a substitute for the laboratory that I have brought this subject forward, hoping that my young friends may find as much pleasure and instruction as I have in making the experiments. Although the study of pharmacy cannot be considered monotonous or tedious, yet a little deviation from the daily routine may probably be advantageous.

The inhabitants of Bristol are highly blessed with a neighbourhood surpassingly beautiful and rich in natural objects. The present subject is a case in point. The geological variety in the nature of the ground on which the city of Bristol is built is very conspicuous; a large proportion is of Palæozoic age, and it contains many of the rarest as well as the most common metals. Especially is it so with the upper rocks of the carboniferous limestone, which are rich in iron, lead, and zinc. In the upper shales and triassic conglomerate we have immense stores of pure hæmatite. Our limestone has been worked for lead since the days of the Romans, and is now almost the only remaining source of zinc.

In the dolomite we have lead, copper, and magnesium.

Iron is always found as carbonate, or ferrous, or ferric oxide, but principally the latter.

The carbonate (Fe C O_3) is obtained chiefly from the coal measures. It contains clay and calcic carbonate, and yields from 22 to 40 per cent. of metallic iron. An average of 30 per cent. would be a tolerably good one.

The following is the analysis of two samples of ironstone collected at Kingswood :—

	Clay ore.	Black band.
Ferrous Carbonate	60.16	76.66
Ferric Oxide . . . . .	.09	—
Manganic Oxide . . . . .	.04	—
Magnesic Carbonate.	2.63	3.92
Calcic Carbonate	16.28	14.54
Alumina	7.31	1.45
Silica	8.00	2.09
Sulphur . . . . .	.33 . . . . .	.33
Moisture and Loss	5.16	1.01
	<hr/> 100.00	<hr/> 100.00
= Iron	29.10%	37%

Very pretty specimens of oxidized ferrous carbonate occur between the beds of limestone, near the south buttress of the suspension bridge. The crystals are small and lamelliform, interlacing with each other, giving a soft velvety appearance. They contain a considerable proportion of calcic carbonate and alumina, which have been derived from the rocks themselves. A sample from the surface of a limestone bed just below a clay parting gave—

Ferrous Carbonate	55.81
Ferric Oxide	4.14
Calcic Carbonate	30.65
Clay	2.33
Fine Sand	1.01
Moisture, etc.	5.06
	<hr/> 100.00
Iron	= 30.32%

The iron ores that are more immediately connected with our present subject are the hæmatites or ferric oxide. Frequently we find this in the hydrated form ($\text{Fe}_2 \text{O}_3 \text{H}_2 \text{O}$) and is then termed göthite. It is often embedded in large quartz crystals, forming beautiful objects for the cabinet. A sample taken from Sion Hill contained—

Ferric Oxide	85.22
Manganic Oxide	.73
Silica	3.91
Combined Water, etc.	10.14
	<hr/> 100.00
= Iron	59.64%

The ferric oxide (Fe_2O_3) is the most common, and is the one from which I have made my preparations. As the principal impurity is silica, it is easily separated by solution.

The bulk of the hæmatite is obtained from a bed of conglomerate resting on the upper limestone shales, where it occurs as a red earthy powder or crystalline nodules. The purest specimens are kidney-shaped masses, or else specular lancet-shaped crystals. As the name denotes, a blood-red colour is produced when the hæmatite is scratched, while the göthite gives a distinct yellowish brown colour. The Bristol hæmatite contains a large percentage of silica, derived from its position in the upper shales. This greatly lowers its money value in the market, because it produces what is technically called "short iron."

It is difficult to arrive at a correct *average* value of the Bristol ore, because it varies so widely. Probably 48 per cent. would not be far from the truth.

The following analyses show the composition of several of the specimens:—

	Clifton.	Winford.	Ashton.
Ferric Oxide	75.19	72.00	85.00
Calcic Carbonate	3.54	2.16	1.01
Alumina	5.15	2.14	6.13
Silica	4.26	14.50	5.22
Manganese	trace	.21	.82
Phosphoric Acid	.01	.37	.25
Sulphur	.02	.03	trace
Moisture, etc.	11.83	8.59	1.57
	<hr/> 100.00	<hr/> 100.00	<hr/> 100.00
Iron	52.63	50.40	58.9

Picked specimen of reniform hæmatite—

Ferric Oxide	88.23
Silica	2.06
Moisture, etc.	9.71
	<hr/> 100.00
Iron	61.76

The iron is easily dissolved out by strong hydrochloric acid. With this solution all the accompanying preparations have been made except the ammonio-citrate of iron. The usual dark colour of the scales cannot be produced without reducing the ferric into ferrous oxide, and the formation of sulphate, afterwards following the pharmacopœia process.

The preparations made from the Clifton hæmatite are—

Ferri Peroxidum.
Liquor Ferri Perchloridi.
Tinct. Ferri Perchloridi.
Liquor Ferri Persulphatis.
Ferri et Ammonia Citras.
Ferri et Quina Citras.

Zinc is always found as calamine or carbonate. The pink colour of the officinal calamine is due to the presence of ferric oxide. It was formerly obtained plentifully in many parts of the Mendips, but is now nearly used up. The specimen on the table is from West Harptree. The discovery of new deposits is being anxiously waited for.

One of the samples of calamine gave—

Zinc Carbonate	94.98
Ferric Oxide	4.11
Silica and Insoluble Matter	1.19
Calcic Carbonate	72
	<hr/>
	100.00

In some places the calamine is quite white and free from iron, to the presence of which it owes its much esteemed salmon colour. It is to be feared that much, if not most, of the calamine of the shops is such in name only. Many specimens have been tested that have not contained a particle of zinc.

Fine calamine is easily distinguished by the blowpipe on charcoal by the peculiar sublimate that changes from yellow to white on cooling.

I have from the Harptree calamine, specimens of—

Carbonate of Zinc.
Oxide of Zinc.
Sulphate of Zinc.

Magnesium.—In the neighbourhood of Bristol we have thick beds of dolomite, which is a mixture of the carbonates of calcium and magnesium ($\text{Ca Mg } 2 \text{ C O}_3$). At Clifton it occurs in a conglomerate, and as it contains from 3 to 6 per cent. of ferric oxide, it has usually a

red colour. At Clevedon there is a very large deposit of this curious mineral. It has a delicate buff colour and a granular texture. In some of the beds are singularly shaped crystals of galena and malachite.

Its composition is at Clifton and Clevedon :—

	Clevedon.	Clifton.
Calcic Carbonate . . .	51·59 . . .	48·26
Magnesian Carbonate . . .	43·96 . . .	41·12
Ferric Oxide . . .	·22 . . .	4·14
Insoluble Matter . . .	·08 . . .	2·34
Moisture, etc.	4·15 . . .	4·14
	<hr/> 100·00	<hr/> 100·00

It is a remarkable circumstance that although the carbonates of lime and magnesium taken *separately* effervesce strongly on the addition of an acid, yet the dolomite, which is simply a mixture of the two in atomic proportion, gives hardly any reaction. Indeed should it show any marked effervescence when subjected to the action of dilute acid, it is a pretty sure indication of there being an excess of lime. I think this peculiarity was mentioned by Dr. Percy in a lecture some years ago.

The Epsoms on the table were made by adding to the powdered dolomite dilute sulphuric acid; both the carbonates are then changed into sulphates. The insoluble sulphate of lime is precipitated, and the solution of sulphate of magnesium decanted off, evaporated, and crystallized.

If the carbonate of magnesia be wanted, the solution of the sulphate is mixed with sodic carbonate as directed in the Pharmacopœia. Both these salts are here in a state of great purity.

Copper.—So far as I know this metal only occurs in the Clevedon dolomite as the hydrated dibasic carbonate ($\text{Cu O, H}_2\text{O. Cu C O}_3$), or as it is usually called “green malachite.” In the specimens on the table it appears as an incrustation of small green crystals. On charcoal before the blowpipe a metallic bead is easily obtained.

I have made from this source the black oxide and sulphate. They can easily be made by separating the copper from lime and magnesium by ammonia, before conversion into the oxide or sulphate.

Lead is very common throughout the district, as galena or sulphide. As before mentioned, the Mendip range has been celebrated for many years for the large quantity of lead found in the limestone. The galena almost always is found in cubes, but in the Clevedon dolomite the configuration is very curious. It somewhat reminds

one of the geometrical puzzles of children, presenting the most eccentric figures resembling railings, stiles, etc., built up of cubes, octohedra, and their derivatives. All the galena in this district is argentiferous, containing about 0·02 per cent. of silver. From the galena I have litharge and carbonate of lead.

An ore of lead called mendipite is peculiar to the Mendip Hills, it is an oxychloride of lead (2 Pb O, Pb Cl_2). It is found in beautiful yellowish white, semitransparent crystals, and is composed of

Plumbic Oxide	60·18
Plumbic Chloride	39·82
	<hr/>
	100·00

It is readily soluble in nitric acid, and easily reduced on charcoal.

Manganese is frequently found as dioxide throughout the district, sometimes as a deposit, sometimes as fine crystals inclosed in quartz, and often mixed with hæmatite; when found as a black powdery deposit it is commonly called "wad."

Silver has before been mentioned as accompanying lead, but I have just separated it from a rock in the carboniferous limestone. It is, I think, the first time that it has been found in that formation. It occurs with ferric oxide in the proportion of from 97 to 300 grains per ton. It is remarkable that there is no lead, quartz, or sulphur. It has been obtained by fluxing with litharge, soda ash, borax, and argol, and then cupellation. A very successful method is to dissolve out the lime with hydrochloric acid, and treat the washed and dried residue with sodium amalgam.

Gold is found in minute quantities with the silver in the Walton limestone. It is procured by dissolving the silver bead with nitro-hydrochloric acid, diluting with distilled water, filtering off the chloride of silver, and evaporating to dryness. The small sample of perchloride of gold on the table was obtained from 50,000 grains of limestone.

The above are only a few experiments that could be made in the short time at my disposal, but are sufficient to prove that a study of metalliferous rocks is a most intensely interesting one to the pharmacist.

Whether the researches are carried on by the aid of pure chemistry, or by means of the microscope and spectroscope, the student has always at his command a source of profit, recreation and instruction.

The PRESIDENT said the occurrence of silver and gold was certainly very curious.

Mr. SIEBOLD asked how the non-effervescence of the carbonates in dolomite on the addition of acid was to be accounted for; it seemed to be out of harmony with the laws of chemistry.

Mr. STODDART said he could not explain it, but it was still a fact.

Professor ATTFIELD said it was well known that crystalline structure greatly affected the rate at which substances dissolved in acid. Magnesite, for instance, required to be finely powdered before an acid would act upon it.

Mr. STODDART said the observation was originally made by Dr. Percy in a lecture delivered in 1854. For himself he did not say effervescence could not be produced; if the substance was warmed and strong acid put to it, it was bound to effervesce; but if a lump were treated without powdering it, it certainly would not effervesce strongly.

The PRESIDENT said he supposed it resisted the action of acid because it was so hard; but when it was dissolved it gave off the gas.

Mr. TICHBORNE said the mystery of non-effervescence might be due to dissociation of carbonic acid in the first place, and, then, the formation of acid salts.

An adjournment then took place for luncheon, which was provided by the Local Committee in the Hall of the Volunteers' Club, kindly lent for the purpose.

On reassembling after luncheon the first paper read was on—

THE MICROSCOPY OF NATAL ARROWROOT.

BY THOMAS GREENISH, F.C.S.

Whilst engaged in 1871 and 1872 in a prolonged microscopical examination of the starch grains generally found in commerce, and more especially those commercially and popularly known as arrow-roots, I observed some distinctive characters in that imported from Natal, which enabled me with little difficulty to identify the product of that colony, since the same characters do not apply in an equal degree, if at all, to the produce of the maranta obtained from any other source. There were placed at my disposal samples of maranta from every British colony that yielded it, and probably every country from whence commercially it was an article of export; but in none of them did I find those special differences which apply to

that of Natal. I felt inclined to doubt what has generally been accepted as a fact, that the Natal arrowroot is the produce of a maranta. I therefore forwarded a sample of it to the late Mr. Daniel Hanbury, at the same time asking him if he had any knowledge as regarded the plant yielding Natal arrowroot. He replied that he had no reason to believe otherwise than it was a maranta, at the same time thanking me for bringing under his notice those points of difference which had suggested my inquiry. I had not at that time any special object in pursuing the subject further, and simply recorded the fact in my notes on this particular starch.

Increased interest in the determination of the starch granules has been observable since the introduction of the Adulteration Act, and some mistakes which occurred and which became public induced me to turn my attention again to this subject, for I observed that Natal arrowroot had been the source of some difficulty. Two cases are recorded in the *Pharm. Journ.*, Feb. 21st., 1874, 685, and July 25th, 1874, 75; one occurred at Greenock, the other at Uttoxeter, in each of which the arrowroot in question was the produce of Natal. I may also add that one of several samples of arrowroot lately sent to me for examination I pronounced to be a Natal maranta. I was afterwards informed that this arrowroot had been purchased and invoiced as Natal arrowroot, but one sample of it having been sent to a public analyst, who had named it *tous-les-mois*, and a second to an analytical chemist who said that it was potato starch, the purchaser consequently felt himself in a difficulty.

In the scientific or historical literature of the starches, published in this country, I had not met with any notice of the difference under the microscope between the starch from the maranta grown in Natal and that grown in any other country, and I felt some hesitation in publishing my own unsupported observations on this subject. Quite recently, however, I have found that the difference has been noticed on the Continent. An able microscopist, Dr. Julius Wiesner in a work published by him, "*Microscopische Untersuchungen*," devotes one chapter to the "*Morphological Relations of some new or little known Starch Grains*," and among others he mentions Natal arrowroot in the following paragraph:—

"Arrowroot from Port Natal has appeared in German commerce, but of the origin or botanical source of it nothing is known. This starch is found to agree with no other arrowroot of commerce, neither with any of the known kinds of starches. It consists of single grains, which are circular or oval to a rounded or trigonal

contour, and are somewhat flattened. The length of the grains ranges between 0.008 to 0.069 m.m., mostly between 0.031 and 0.045 m.m. The hilum, a round solid body, appears especially clear both under water and glycerin. The eccentricity of the granules ranges between $\frac{1}{16}$ and $\frac{1}{3}$; the very numerous laminæ appear under water with especial clearness." Wiesner also adds that in scientific literature he has only found one notice of it, and that by Flückiger,* who states that the botanical source of Natal arrowroot is unknown to him, that the grains are very irregular, elliptic or globular, and even trigonal; and that often the grains have the appearance of potato starch, but in size they do not exceed 0.070 m.m. Potato ranges between 0.060 and 0.100 m.m.

Wiesner gives in his work the annexed drawings of Natal starch. The mussel-shaped granule very well illustrates one, and probably the most common, form of granule of which the Natal arrowroot is composed; and his description of the laminæ, very fairly represents my own view of the subject.



Starch granules of Port Natal arrowroot. Mag. 800 times. *a*, profile; *b*, *b'*, surface view.

Vogl,† author of the Commentary on the Austrian Pharmacopœia, also mentions the Natal arrowroot, and refers its origin to the *Canna edulis*, the plant yielding tous-les-mois.

Nägeli in his great and exhaustive work‡ on the starch grains, makes no mention of Natal arrowroot by name; but after describing a sample of Jamaica arrowroot from *Muranta Arundinacea*, he says that "he has had sent to him from England a sample of starch, as a variety of potato starch, but he finds that it is a kind of Jamaica arrowroot," and then he goes on to give a description of it. "The grains are from oval to round, frequently trigonal, seldom having a transverse fracture for hilum; the eccentricity is $\frac{1}{3}$." This description differs from one that he had just previously given of Jamaica arrowroot, and does not apply to potato, but corresponds with Wiesner's description of the Natal, and it seems probable that the starch sent to him from England as a variety of potato starch was really a Natal starch. In support of this opinion, I may add that Dr. John Squiers, of Demerara, who conducted a most careful investigation

* "Nahrungs und Genussmittel." † "Lehrbuch der Pharmacognosie."

‡ "Die Stärkekörner," Zurich, 1858.

into all the tropical starch-producing plants, in his report published in 1847, states that "arrowroot from Africa had been sent to the West India Islands in the ships with the liberated Africans, and thence re-exported to England." There is, therefore, I think, great probability that the arrowroot in question was originally from the coast of Africa.

It must now be evident that I am not alone in my observation of Natal arrowroot differing in its appearance under the microscope from the produce of any other maranta known in commerce.

It would be difficult to state from the appearance of any single granule under the microscope, that it was even a maranta, and it would be still more difficult to say that it was a maranta from Natal. But when seen in number on the field of the microscope, the peculiarities to which I have referred could not, I think, escape the most casual observer, much less the eye educated to the microscopical analysis of starch granules. Wiesner's description is very characteristic; the laminæ are seen with singular clearness. He refers also to the *eccentricity of the starch*. In the microscopy of starch the word concentric is often misplaced, and the term eccentric is rarely used in this country. Take as an illustration, one of the three starches, wheat, barley, or rye, having the form of a circular disc, the hilum in the centre is centric and the laminæ around it are concentric. If, again, another form be taken, represented by curcuma, canna, maranta, potato, and others of similar shape, the hilum is out of the mathematical middle point or centre, it is eccentric, and although the first ring may be concentric with regard to the hilum, the remainder are eccentric; the curcuma is an instance of excessive eccentricity. Compare the distance of the hilum from the upper part of the grain with its distance from the lower part, and it gives the eccentricity. The eccentricity of grains of the same kind of starch is tolerably constant. Now if this plan of measurement be applied to the granules of the Natal maranta, it will be found that they average an eccentricity of $\frac{1}{1.5}$ to $\frac{1}{3}$. This is an important feature in Natal starch; other marantas as well as potato starch average $\frac{1}{6}$ eccentricity.

I have used the word "hilum," because it is a commonly accepted term, but it is also a misplaced one. Properly it should be called the "nucleus." Let the early history of a starch granule be considered. Our first knowledge of it is a cell filled with a homogeneous substance; there is neither hilum nor the appearance of lamination. In process of growth a differentiation takes place; there is a nucleus formed, and a separation of the remainder into

layers, alternating in density. One layer has been termed anhydrous, but incorrectly; the German words signifying "water-rich" and "water-poor" layers more truly express their true conditions. They are optically different, depending upon the relative refractive powers of the layers in different states of density. The nucleus in the living starch grain is the softest part; it contains matter of the most recent formation, and is the most delicate part of the granule. It is on this point that the cracks in the drying of the starch grains occur, and being filled with air, show as dark lines under the microscope, and to these in their different forms the term hilum is given. Starch grains fresh from the plant contain 40 per cent. of water. Many starches have what may be termed a special fracture; this in granules of the same kind is often very characteristic of the particular starch, as in rye starch. But too much reliance should not be placed on these accidental markings. The starch granule when first formed has no such mark, but either from pressure in the cells, or too rapid an alteration in density, they do occasionally occur even in fresh starch just obtained from a living plant. The singular clearness of the laminæ is, I believe, the reason why Natal starch has been so frequently mistaken for that of potato. The starch of the maranta differs from that of the potato, in being on the average only two thirds the size, the laminæ are less distinct, also there is generally a transverse fracture as a hilum, and as a rule the nucleus of the potato starch is at the smaller end of the granule. If measurement be resorted to, it will be found that potato ranges from 0.060 to 0.100 m.m., while a maranta ranges from 0.022 to 0.068 m.m. These points, together with the shape of the granule, are distinctions broad enough to separate potato from maranta at least, if not from any other starch of commerce.

The question now arises—What is the botanical source of Natal arrowroot? I did hope through the kind assistance of some friends to have shown you here to-day a specimen of the *Maranta arundinacea* direct from Natal, and from which there can, I think, be little doubt that the arrowroot is obtained, but I have been unsuccessful and even disappointed. The literature of this subject is very scanty. In the *Pharmaceutical Journal** is a note to this effect. "Prof. Bentley exhibited a plant which had grown from one of the rhizomes sent over with African arrowroot, a specimen of which was exhibited at a previous meeting of the Society. It had

* *Pharm. Journ.*, 1st series, x., 272.

been cultivated at the Royal Botanic Society's Gardens, Regent's Park, and found to be *Maranta arundinacea*."

There is no mention here of Natal, and although arrowroots are produced in the Canary Isles, Liberia, Lagos, and Sierra Leone, they are not in sufficient quantity for export. In a history of the Colony of Natal, by the Rev. W. Holden (1855), is printed the second annual report of the Agricultural and Horticultural Society (1851), and it contains some valuable information bearing directly on this part of the subject. Mr. McKen, the secretary, states that "from a single plant of the arrowroot (*Maranta arundinacea*) which he had procured with other valuable plants from the Royal Gardens at Kew, he had then sufficient to plant at least the third of an acre, and from the abundant produce and easy cultivation he had no doubt it would soon become an important article of export." In 1856, Natal exported 818 cwts., in 1870 the quantity of it had increased to 3320 cwts.

In the absence of a specimen of the identical plant, this is the most satisfactory evidence that I can furnish that the arrowroot imported from Natal is the produce of *Maranta arundinacea*.

Lippman* has recorded in a tabular form under three heads the results of a series of experiments on the temperature at which the different starch grains "swell," "burst," and "lose all shape." I have done the same for comparison with each of the three starches—Bermuda, St. Vincent, and Natal. I mixed 1 dram of the starch with 6 oz. of cold water, and gradually, with constant stirring, raised the temperature.

Natal Starch.

50° C. No perceptible change.

55° C. A few grains swollen with stellate markings.

60° C. Many have lost all form, but small ones little affected.

65° C. Greater part a shapeless mass.

Bermuda.

50° C. No perceptible change.

55° C. No perceptible change.

60° C. Grains slightly swollen.

65° C. Some have lost all form, small grains little affected.

* *Jahresbericht für Chemie*, von Liebig und Kopp, 1861, 745.

St. Vincent.

50° C. No change.

55° C. No change.

60° C. Very little change, only a few swollen.

65° C. Very slight general swelling, and one here and there a shapeless mass.

It results from these experiments that Natal at 55° C. seems equally affected with Bermuda at 60° C., and St. Vincent at 65° C. I made an examination of each under the microscope at every rise of 5°. I must, however, add that there is great difficulty in determining the exact bursting point of starch granules. Any table can only be considered, therefore, as a relative approximation.

It is a curious fact that at a temperature which bursts the larger grains the smaller ones are scarcely acted upon. Nägeli states that the swelling of starch grains as a rule begins at 55° C. for large grains, and 65° for small; the small ones requiring 10° higher temperature than the average of larger ones to produce the same result. I carried my experiments further to determine whether the same difference existed in the temperature required to make a starch jelly. For this purpose I used—

3j. starch.

3ss. cold water.

3jss. boiling water.

I mixed the starch with the 3ss. cold water, and then added the boiling water, and gradually with constant stirring raised the temperature until complete gelatinization took place. I found that Natal required 65° C., Bermuda 70° C., and St. Vincent 75° C. The St. Vincent jelly was the most transparent, the others were somewhat translucent.

As a practical result, a very important yet difficult question may be asked—Have these experiments any bearing on the relative dietetic value of Natal as compared with other starches? Nägeli, to whose work on the starches I must again refer, says that the structure of the starch granule is a system of laminæ from the nucleus to the outer envelope; that these laminæ and the whole contents of the grain consist of a very intimate mixture of granulose and cellulose throughout, in different relative proportions; that if the granulose be extracted, the cell structure remains as a skeleton of cellulose; that granulose is very digestible, and cellulose much less so; also that wheat starch contains more granulose than potato

starch. It seems, therefore, probable that the dietetic value of the different starches may be in some measure due to the relative proportions of these two bodies; the dense laminae containing relatively more cellulose than those that are less dense. These facts, taken in connection with the experiments, point to the probability that Natal starch may be more valuable in a dietetic point of view than some others which are found in commerce.

Raspail, in 1825, described a starch grain as consisting of an outer envelope or integument containing a gum soluble in water.

Fritzsche, in 1834, proved Raspail's views to be incorrect, and was the first to publish the lamellated structure of the starch grain. His views have since been more fully elaborated by Nügli, and are now generally accepted: that the starch granule is made up of different layers 'partitioned by a cellular membrane, the nucleus being less dense than the cell wall. But the more recently published views of Hartig* on the structure of the starch granule, accompanied by some very careful experiments and drawings in illustration, require, I think, that the very generally accepted theory on this subject be somewhat modified.

In a very interesting paper on the edible starches of commerce by Mr. P. L. Simmonds, read at the Society of Arts, March 28th, 1873,† he states that "in Bermuda the production of arrowroot has been declining and has now given way to other and more profitable crops." Bermuda exported in 1851 arrowroot to the value of £10,320, in 1861, £4,291. Imported into the United Kingdom: 1868, 60 cwt.; 1869, 90 cwt.; 1870, none.

As it seems probable, therefore, that at no very distant period Bermuda arrowroot may exist only in name, the relative dietetic value of importations from other colonies may profitably engage our attention.

That the peculiarities in the starch to which I have referred exist, there is abundant evidence; that they have been a source of error in diagnosis, there can be no doubt. But why there should be this difference in the starch of a maranta grown in Natal, distinguishing it from the produce of the same plant grown in any other locality, forms an interesting subject for further investigation, and we must be content to wait until the life history of a starch granule is better understood and can be fairly written.

* "Ueber den Bau des Stärkemehls," von Prof. Dr. Th. Hartig.

† *Pharm. Journ.*, 3rd series, iii., pp. 833, 853.

The PRESIDENT said no doubt the members all felt, as he did, thankful to Mr. Greenish for having had the patience to conduct all these experiments, and he thanked him heartily in their name. He had not been aware that there was any doubt as to the source of Natal arrowroot, but he thought Mr. Greenish had now made it pretty plain what that source was. He wished to ask whether the condition of the granules as to dryness did not affect the behaviour of starch, and whether the experiments had been made with starch dried at a uniform temperature.

Mr. GREENISH said the starches used had been kept in different situations, whether they were equally dried he did not know.

The PRESIDENT remarked that it was singular to hear that Bermuda arrowroot was not now imported, for an article called by that name was on sale in the shops, and was being sold in his own shop at that time. The paper was exceedingly valuable in its elucidation of the structure of the grains.

Mr. STODDART said he had been much interested in the paper, but he could not quite agree with the author. He was one of the parties to the Uttoxeter case, and he was surprised that any one should have mistaken the arrowroot for potato starch, the hilum and the rugæ were not in the same position as in potato starch, and no microscopist could look at the sample and not be struck with the extraordinary distinctness of the lines; there was no other starch in commerce at all like it. When he saw it, he supposed it had been dried at different temperatures, the distinction was so very marked. What was wanted was to be able to see the starch granules as opaque objects. The refractive power of the light in the microscope was so great that it disturbed the vision, but if the granules could be seen as a solid marble, there would be a vast difference. Take wheat starch for example. A question arises as to whether it is adulterated with starch from some leguminous plant, the granules of which assume a kidney shape. There was no rule as to shape to go by; but the positions of the hilum and the rugæ were so strongly marked in Natal arrowroot that no man who was accustomed to look through a microscope could mistake them. He saw the sample at Uttoxeter which the analyst had mistaken for potato starch; but any one who compared the two would see that there was as much difference between the rugæ in the Natal arrowroot and in the potato starch as there was between that starch and turmeric. It did not matter whether you looked at them in fluids or in the dried state. He had heard a number of persons say that when the granule was in fluids they could not see the hilum, nor

when it had been dried. He himself used a mixture of spirit, water, and glycerin, he could hardly tell the exact proportions, but with this mixture he found the rugæ and the hilum of the granules of starch very distinct indeed. The subject was a most interesting one, and well worthy of discussion.

Mr. MACKAY said reference had been made to some arrowroot which had been condemned in the West of Scotland. It was arrowroot which was not imported by himself, but which was purchased from a first-class house in London, and sent in original cases as it was received—not, however, before it was examined—and forwarded in the belief that it was genuine Natal arrowroot. The customer wrote to him asking for a written guarantee. He declined to give one, but stated his opinion that it was genuine Port Natal arrowroot. The next act in the drama was that a note came from the purchaser enclosing a certificate from two analysts which stated the arrowroot to be adulterated with from ten to twenty per cent. of what the firm of public analysts called torrefied arrowroot or some other flour. Samples of this condemned Natal arrowroot were therefore sent to four gentlemen, namely, Professors Redwood, MacLagan, Attfield, and Archer, and the curious result was, that all these gentlemen declared there was no adulteration whatever, and no torrefaction, but that the arrowroot was pure starch obtained from a maranta. The Greenock analysts then withdrew the assertion as to adulteration. In a letter published at the time, Professor MacLagan stated that he had passed many thousands of grains of this maranta under the microscope, and he discovered six granules which he said were split. He was glad the subject had been brought forward, for this discussion might lead to further investigation. What Mr. Greenish had said afforded some reason for desiring the more general use of the microscope, which did not at present enter into the pharmaceutical examinations at all. He said this on the special authority of Professor MacLagan, of whose views on this point some public notice might probably soon be taken; more especially as he was fortified in these views by the fact that at one of the recent Major examinations at Edinburgh, had the microscope been used, one gentleman would not have been rejected. As it was, he failed to detect some adulteration which the microscope would have made plain.

Mr. BRADY said that he had noticed that the term "life-history" of starch had been employed. He thought the idea of "life-history" in any physiological sense had been exploded, and that the researches of Mr. Rainey, published several years ago, had demonstrated the

fallacy of the supposition that starch had anything in common, structurally speaking, with the vegetable cell. It appeared to be, on the contrary, an example of spherical coalescence, to be accounted for on a purely physical theory. With these views he had some objections to both the terms "nucleus" and "hilum," as applied to the dark focal spot of the starch granule. He did not for a moment contest the value of the external physical characters revealed by the microscope as a means of identifying the starches of different plants, only they should not be invested with the sort of importance which there seemed some disposition to assign to them. Mr. Rainey's researches had scarcely met with the attention they deserved even in this country, much less in Germany.

Professor REDWOOD said it might be expected that he could throw some light on the subject, but the particular case alluded to was scarcely sufficiently fresh in his recollection. He remembered that he took a great deal of pains to get what he was assured was an authentic sample of Natal arrowroot with which to compare the sample that was sent to him; and he came to the conclusion that the sample sent from Edinburgh consisted of Natal arrowroot and of nothing else. As far as he could make out, what the analyst in Scotland had referred to as the effect of torrefaction was what Mr. Greenish had alluded to as characteristic of the starch of the maranta, that was a slight crack at one of the ends; and this he found on that occasion and on several occasions since was observable more frequently in the Natal arrowroot than in any other kind of arrowroot which had come under his notice. In other instances in which arrowroot had been suspected to have been adulterated with potato starch he had come to the conclusion that the samples were those of Natal arrowroot. The question was often asked in respect of particular samples, "Is this genuine arrowroot?" He should like to know distinctly what the term arrowroot specifically signified. Was it to be taken to signify the starch of a maranta? There were samples of starch which were perhaps in a dietetic sense equal to arrowroot,—starches which were distinguished by specific names, arrowroot being used as a generic name. There were Portland arrowroot, Tahiti arrowroot, and others; and it was very desirable that it should be distinctly and publicly indicated what it was that the name of arrowroot was to be restricted to, especially now that articles were being offered for sale to which certain persons considered the term did not properly apply. Was arrowroot to be considered the starch of a maranta? if so, were all maranta starches and no others to be included under the name? While Portland

arrowroot and other specific terms were in use, there would be difficulty with regard to the term arrowroot. No doubt the arrowroot which the President was selling was identical in its physical and chemical characteristics with the starch of the maranta, even although it might not be prepared in Bermuda. Speaking generally, there ought to be more discrimination in the application of specific names to such an article as arrowroot.

Mr. THRESH said he had examined some samples of arrowroot, and found that 10 per cent. of the granules had fractures extending from the circumference to the hilum, but not over the hilum. He sent one to Mr. Siebold who reported that it was not a genuine arrowroot; a corresponding sample was sent to an analyst in Manchester who reported that it was. He drew the attention of the latter analyst to the dip in the starch granules, and to the shape of many of them; and the analyst then said there were some granules which might mislead, but still he felt confident they were the starch of maranta. It was probably the cracks from the hilum to the circumference, and not the cracks across the hilum, that caused one analyst to say that the starch was altered by torrefaction.

Mr. GREENISH said Mr. Mackay sent him some arrowroot from Greenock, and there was no question about its being *Natal maranta*. It had fragments of maranta root mixed up with it, and that determined the point beyond a doubt. As to the use of the term arrowroot, he adopted it as a commercial and popular term; but he would prefer to use the word starch in a scientific paper. A public analyst had stated that pepper was sometimes mixed with arrowroot and starch, but that seemed to him to be unscientific. Allusion had been made to what gave students a little trouble with regard to starch grains. He would remind them that in the starch of cereals such as wheat, barley, and rye, the large granules were round; but besides these there were compound granules, which were compounds of smaller granules, and hence the apparent variation in the shape.

The next paper read was entitled—

FURTHER RESEARCHES ON THE CRYSTALLINE CONSTITUENTS OF BARBADOES AND SOCOTRINE ALOES.

By WILLIAM A. TILDEN, D.Sc.LOND., F.C.S.

The names employed in the following pages to designate the crystalline principles obtained from the several varieties of aloes are to be understood as follows:—

Barbaloin.—From Barbadoes aloes. Discovered by Smith & Co., of Edinburgh, and analyzed by Stenhouse, 1851.

Socaloin.—Isolated from Socotrine aloes in 1856, by T. B. Groves.

Nataloin.—Discovered by Flückiger, 1871.

Zanaloin.—Prepared by Histed, from a variety of Socotrine aloes imported by way of Zanzibar. Analyzed by Flückiger, 1871.

Before proceeding to the comparison of the properties of these bodies, and the discussion of their chemical constitution, I propose to describe briefly some additional experiments lately conducted in my laboratory upon the aloin from Zanzibar aloes. All the new analyses included in the following account were made for me by Mr. W. A. Shenstone, to whose care and patience I take this opportunity of expressing my obligations.

Zanaloin.—I am indebted to Messrs. Hanbury, of Plough Court, for liberal supplies of very fine Zanzibar aloes, from which the specimens of aloin now produced were prepared. Without such aid, in fact, the experiments must have come to an end prematurely, as I found it impossible to obtain appreciable quantities of the crystalline constituent from commercial samples of the drug produced from other sources. The process employed for its isolation was devised by Mr. Histed, and, although rather troublesome and not very productive, I have not succeeded in improving upon it. It consists in macerating the coarsely powdered aloes with a sufficient quantity of proof spirit to make a paste, and afterwards gradually expressing the liquid from the mass. The yellow cake which remains is purified by crystallization from water, and then from rectified spirit.

The aloin obtained in this way has already been described by Dr. Flückiger (*Year-Book of Pharmacy*, 1871), and in the main my observations agree with his. I have found that when dried by exposure to air at the ordinary summer temperature the quantity of water it contains varies perceptibly from day to day, and it is difficult to get it into such a condition as to retain a constant weight. By exposure in a vacuum over sulphuric acid it loses weight rapidly, and two determinations made in this way gave 14.06 and 13.9 per cent. respectively. The loss of weight experienced upon exposure to a temperature of 115° to 120° C. was somewhat greater than this—14.46 and 15.95 per cent. in two recorded instances—but this greater loss is in all probability due to partial decomposition, the aloin fusing and becoming darker in colour.

Two determinations of carbon and hydrogen made upon the air-dried substance gave these results:—

	I. Twice Crystallized.	II. Crystallized Three Times.	Mean.
C . . .	52.70 . . .	52.87 . . .	52.78
H . . .	6.42 . . .	6.39 . . .	6.40

No great importance, however, attaches to these numbers in consequence of the uncertainty regarding the hygroscopic condition of the substance.

After drying in a vacuum over sulphuric acid three combustions were made, with the results indicated below. In all these and subsequent analyses the substance was burnt with a mixture of lead and potassium chromates, all the usual precautions being observed:—

I. .2926 gram of anhydrous zanaloin gave .6379 of CO_2 and .1528 of H_2O .

II. .2650 gram gave .5792 CO_2 and .1370 H_2O .

III. .2606 gram gave .5678 CO_2 and .1380 H_2O .

	I.	II.	III.	Mean Percentages.
C . . .	59.45 . . .	59.60 . . .	59.42 . . .	59.49
H . . .	5.80 . . .	5.74 . . .	5.87 . . .	5.80

Dr. Flückiger gives 59.20 and 5.94 as the percentages of carbon and hydrogen in zanaloin dried over sulphuric acid, but the slight discrepancy may be accounted for by the more complete dryness of the substance operated upon by us.

Bromozanaloin.—The aloin upon which I have been operating was prepared from aloes taken, I am informed, from the same sample upon which Flückiger made his experiments. I have also been careful to prove by repeated application of the test, that my zanaloin gives the same reactions with nitric acid and other oxidizing agents as the zanaloin examined in the laboratory at Bern. We have been more fortunate than Professor Flückiger in the production of definite brominated and chlorinated derivatives from this body. By dissolving zanaloin in water and adding an excess of bromine water to the solution, a yellow precipitate was obtained, which, after two crystallizations from spirit of wine, and drying *in vacuo*, gave the following analytical results:—

I. .3537 gram gave .4485 of CO_2 , and .0942 of H_2O .

II. .3442 gram gave, by heating in a sealed tube with nitric acid and nitrate of silver, .3405 of Ag Br.

Percentages.

	I.	II.
C	34.57	—
H	2.95	—
Br	—	42.09

Another specimen made by reversing the operation, pouring the solution of aloin into excess of bromine water, and allowing the mixture to stand some hours before collecting the precipitate, gave results which differ slightly from the foregoing. The proportion of bromine found in this case being somewhat greater, and of carbon and hydrogen somewhat less, than before.

The air-dried substance lost in this case 9.22 per cent. of its weight by exposure in a vacuum:—

I. .2769 gram of bromozanaloin dried *in vacuo* gave .3458 of C O_2 and .0670 gram of $\text{H}_2 \text{O}$.

II. .5970 gave by ignition with lime .6043 of bromide of silver.

Percentages.

	I.	II.
C	34.05	—
H	2.65	—
Br	—	43.06

Chlorozanaloin.—This body was obtained by the action of hydrochloric acid and chlorate of potassium. The crystals are bright yellow and lustrous, and closely resemble those of chlorobarbaloin. They gave off 13.65 and 14.47 per cent. of water when exposed to a temperature of 110° to 115°C .

I. .3608 gram dried at 110° gave .3644 gram of chloride of silver.

II. .6393 gave .6496 of Ag Cl .

Percentages.

	I.	II.	Mean.
Cl	24.97	25.12	25.04

Acetyl-zanaloin.—Dry zanaloin was boiled for nearly half an hour, with about three times its weight of acetic anhydride. The solution diluted with a little alcohol and poured into water gave a pale yellow precipitate which could not be made to crystallize from either alcohol or ether. After drying in the air it gave off mere traces of water *in vacuo*.

I. .2196 gram gave .4755 of C O_2 , and .1063 of water.

II. .2732 gram gave .5874 of C O_2 , and .1328 $\text{H}_2 \text{O}$.

Percentages.

	I.	II.	Mean.
C	59.05	58.63	58.84
H	5.37	5.39	5.38

Acetyl-barbaloin.—Prepared in the same way, is a yellowish white curdy substance, the analysis of which gave the following numbers:—

I. 2774 gram gave 5976 of $C O_2$, and 1334 of $H_2 O$.
 II. 2150 gram gave 4630 of $C O_2$, and 1064 of $H_2 O$.

Percentages.

	I.	II.	Mean.
C . . .	58.55 . . .	58.73 . . .	58.63
H . . .	5.34 . . .	5.49 . . .	5.41

Leaving out of consideration the question of the formula deducible from these figures, I propose now to compare them with the results which have been obtained by different experimenters in operating upon the aloin of Barbadoes aloes.

<i>Barbaloin.</i>		<i>Zanaloin.</i>	
<i>(Dried in vacuo.)</i>		<i>(Dried in vacuo.)</i>	
Stenhouse (average).		Tilden (average).	Flückiger.
C 59.31 per cent.		59.49	59.2
H 5.88 „		5.80	5.9
<i>Bromobarbaloin.</i>		<i>Bromozanaloin.</i>	
Stenhouse (average).	Tilden.*	Tilden.*	Tilden.
C 35.48	34.66	34.57	34.05
H 2.78	3.04	2.95	2.65
Br 41.97	41.96	42.09	43.06
<i>Chlorobarbaloin.</i>		<i>Chlorozanaloin.</i>	
Tilden (1872).		Tilden (1875).	
C 45.17		—	
H 3.70		—	
Cl 25.13		25.04	
<i>Acetyl-barbaloin.</i>		<i>Acetyl-zanaloin.</i>	
(Average.)		(Average.)	
C 58.63		58.84	
H 5.41		5.38	

A review of these numbers is sufficient in my opinion to convince any one that it is impossible to distinguish by quantitative analysis the aloin of Barbadoes from that of Socotrine or Zanzibar aloes.

The only difficulty encountered in this table of results occurs in Stenhouse's analysis of the brominated derivatives.

On referring to his paper, however, I found that this compound had been prepared by adding the bromine water to the solution of the aloin. Now the experiments I have described in a preceding paragraph indicate, I think conclusively, that the substance obtained in this way is not pure, that it is in fact contaminated with aloin,

* Both prepared at the same time and in the same way, by pouring bromine water into solution of the aloin.

from which it differs so slightly as regards its solubility in spirit of wine that the two substances cannot be completely separated by recrystallization from that solvent. The only way of avoiding this contamination is to bring the aloin at once into contact with an excess of bromine, and this is best effected by reversing the process of precipitation by pouring the solution of aloin into the bromine water.

The conclusion, then, to which these experiments lead us is that these two crystalline bodies, which I have called barbaloin and zanaloin, are isomeric when in the anhydrous state. This conclusion is supported by all that we know of their botanical origin and physical characteristics, as well as their chemical properties. The two bodies resemble each other in appearance and in taste, and though zanaloin is slightly paler in colour and a little more soluble, there is no marked difference in these respects. It may be observed, however, that zanaloin and its derivatives contain a larger amount of water of crystallization than barbaloin. As to qualitative tests there is but one in the action of which any difference can be perceived in operating on the two bodies, and that is nitric acid. With barbaloin nitric acid gives an instant coloration which fades quickly to orange-red. Zanaloin, on the contrary, moistened with the same liquid, gives no immediate coloration, but on the application of heat an intense orange-red is developed. They both give chrysammic acid under the prolonged action of nitric acid, and both yield crystallizable chloro- and bromo- substitution derivatives which resemble each other very closely.

Socaloin is believed, and with great probability, to be identical with zanaloin. Zanzibar aloes is but a variety of Socotrine, and the qualitative reactions of the two agree in every respect. But as yet no quantitative analyses of socaloin have been published.

Nataloin is evidently widely separated from the rest of these crystalline principles by its inferior solubility, and especially by the circumstance that it yields no chrysammic acid nor definite chloro- or bromo- substitution derivatives.

Taking all these circumstances into consideration, I am unable to adopt the suggestion of Rochleder that these bodies constitute three successive terms of a homologous series. On the contrary, the analytical results obtained by different experiments indicate that barbaloin and zanaloin have the same composition. They must therefore be represented by the same formula. I propose for them both in the anhydrous state the symbols $C_{16}H_{18}O_7$, which, as will be seen by the annexed statement of percentages, agrees satisfactorily

with all the analytical numbers. This, which is simpler than the formula hitherto received, is also conformable with the statement of Graebe and Liebermann that aloin yields anthracene or some closely allied hydrocarbon, perhaps methylantracene, when heated with zinc.

$C_{16}H_{20}O_7$	$C_{16}H_{18}O_7$	$C_{16}H_{16}O_7$
requires	requires	requires
C 50.25	C 59.62	C 60.00
H 6.17	H 5.59	H 5.00

Bromo-derivative

$C_{16}H_{15}Br_3O_7$
requires
C 34.34
H 2.68
Br 42.93

Chloro-derivative

$C_{16}H_{15}Cl_3O_7$
requires
C 45.12
H 3.52
Cl 25.03

Acetyl-derivative

$C_{16}H_{15}(C_2H_3O)_3O_7$
requires
C 53.92
H 5.35

This formula, $C_{16}H_{18}O_7$, has been proposed by Rochleder for nataloin, and it agrees closely with the results of my analyses of that substance; but the discussion of this part of the question must be deferred till further experimental results have been accumulated.

Dr. A. TILDEN also placed on the table a number of specimens of products obtained from the different aloins, by nitric acid and other reagents. Most of them, he said, were coloured, and had a beautiful lustre.

The PRESIDENT said any chemist who had ever engaged in experiments of this kind must be aware that Dr. Tilden had expended a vast amount of labour and time in preparing the paper. He wished the Conference had more of such papers. When Flückiger made his discovery of nataloin, Mr. Hanbury asked him to repeat the experiment. It took him by surprise, and every one else. Every one had supposed there was but one kind of aloin, and when he (the President) got socaloin he had no idea but that he had got the same thing from

another source. How the aloins differed it was impossible to say, but they appeared to yield the same numbers on combustion. There seemed to be as many varieties of aloin as there were of tannin.

Mr. SCHACHT said he should like to ask one question. Dr. Tilden was good enough to show him, a few weeks previously, some of these reactions; amongst them that with bichromate of potash. It struck them both that it was like that obtained when the same reagent was applied to strychnine. Had that experiment been repeated?

Dr. TILDEN said that on repeating the experiments several times under a variety of conditions, he had come to the conclusion that no practical analyst could mistake the reaction for the strychnine reaction, although at first sight it seemed to resemble it. The colour produced was not a purple, such as the splendid purple strychnine gives, which fades to a red, but a greenish purple, which fades to a yellow. He admitted that at first sight there was a resemblance. As he could not apply the results of these experiments, he did not bring them forward.

The PRESIDENT said, when Mr. Hanbury sent him the crystals as above mentioned, he asked him to perform an experiment, and to use the vapour of nitric acid, the aloin being first moistened with sulphuric acid. It was not a red colour which was produced, but a green.

Mr. MACKAY asked whether there had been an opportunity of ascertaining from medical men the relative strengths of the different kinds of aloin, so as to determine their commercial value; or whether they differed in value.

Dr. TILDEN said so far as he knew he was the possessor of the only specimen of zanoloin in existence; and he could not say how much he should like to take per ounce for it. If he might judge from the labour it had cost to produce it, it would be rather a costly article. He had hoped he should have been able to bring forward the results of experiments with regard to its physiological action. He had induced Mr. Dobson to undertake experiments at the Bristol Infirmary; but unfortunately Mr. Dobson took a holiday in the midst of his researches, and the results were not concluded in time to bring them forward this year. He hoped towards the end of the present year to have them completed, and to publish them.

The PRESIDENT said he supposed the aloin of commerce was the produce of the Barbadoes aloes.

Dr. TILDEN said there was no doubt of that; the others were so difficult to obtain.

A paper was then read on—

SOME POSSIBLE APPLICATIONS OF SALICYLIC ACID IN PHARMACY.

By F. BADEN BENDER, F.C.S.

The fact pointed out by Professor Kolbe and others some few months since that salicylic acid possesses remarkable antiseptic properties, that it is non-poisonous, odourless, and almost tasteless, must have set many pharmacists thinking what applications might be made of such a substance in practical pharmacy; and probably many other members of this Conference have instituted experiments somewhat similar to those I wish to lay before you to-day, with the view of testing the value of such applications. I shall be very glad to find that there are gentlemen present in a position to check my results, as time has not as yet permitted me to repeat many of my experiments.

It has already been shown by Kolbe* that salicylic acid is capable of arresting and preventing alcoholic and lactic fermentation, that it prevents the action of emulsin on amygdalin, and also the production of essential oil of mustard when the powdered seeds are moistened with a very dilute solution of the acid. A series of experiments made by Dr. Godeffroy in the Vienna Pharmaceutical School† prove that many syrups may be preserved by the addition of small quantities.

I have placed on the table a number of pharmaceutical preparations, all more or less subject to spontaneous decomposition. Each is labelled with name, date, and proportion of salicylic acid which has been added. It will be seen that many of these are from two to four months old, some of which are scarcely distinguishable from those prepared yesterday.

No. 1.	Infusum Rhei,	prepared April 25,	and containing $\frac{1}{4}$ grain of salicylic acid to the fluid-ounce.
„ 2.	Infusum Sennæ Co.	April 25.	Acid salicylic, $\frac{1}{4}$ grain to fluid-ounce.
„ 3.	Decoctum Cetrariæ.	May 17.	$\frac{1}{4}$ grain to fluid-ounce.
„ 4.	„ „	„	1 grain to fluid-ounce.
„ 5.	Infusum Gentianæ Co.	June 19.	$\frac{1}{4}$ grain to fluid-ounce.
„ 6.	„ „	„	$\frac{1}{2}$ grain to fluid-ounce.
„ 7.	Infusum Rhei.	„ 5.	$\frac{1}{2}$ grain to fluid-ounce.
„ 8.	Infus. Aurantii.	„ 19.	$\frac{1}{4}$ grain to fluid-ounce.
„ 9.	„ „	„	$\frac{1}{4}$ grain to fluid-ounce.
„ 10.	„ Cuspariæ.	„	$\frac{1}{4}$ grain to fluid-ounce.
„ 11.	„ „	„	$\frac{1}{4}$ grain to fluid-ounce.

* *Pharm. Journal*, Nov. 28, 1874, 421.

† *Pharm. Journal*, May 1, 1875, 865.

No. 12.	Infus. Senegæ.	June 19.	$\frac{1}{4}$ grain to fluid-ounce.
" 13.	" "	" "	$\frac{1}{2}$ grain to fluid-ounce.
" 14.	" Buchu.	Aug. 9.	$\frac{1}{4}$ grain to fluid-ounce.
" 15.	" "	" "	$\frac{1}{4}$ grain to fluid-ounce.
" 16.	" Aurant. Co.	" "	$\frac{1}{4}$ grain to fluid-ounce.
" 17.	" "	" "	$\frac{1}{2}$ grain to fluid-ounce.
" 18.	Suc. Limonis.	Expressed May 17.	$\frac{1}{2}$ grain to fluid ounce.
" 19.	" "	" "	1 grain to fluid-ounce.
" 20.	Mist. Acaciæ.	June 10.	$\frac{1}{4}$ grain to fluid-ounce.
" 21.	" "	" "	1 grain to fluid-ounce.
" 22.	Paste—composed of 1 dram wheat-flour, 7 drachms water, 1 grain salicylic acid. Prepared June 7.		

In experimenting on these preparations, five specimens of each were in most cases set aside, one in its ordinary unfortified condition, and the other four with the addition of $\frac{1}{8}$ gr., $\frac{1}{4}$ gr., $\frac{1}{2}$ gr., and 1 grain of salicylic acid to the fluid ounce. It was not until the proportion of $\frac{1}{4}$ grain, and in some cases $\frac{1}{2}$ grain, to the fluid ounce was reached, that the result was entirely satisfactory. The whole of the specimens have been tested under very trying conditions. They have been kept through the hottest part of the year, at a temperature of 65° to 75° F., in uncorked bottles only loosely covered with paper. A slight sediment took place in some, from which they were decanted a week ago, and since then spots of mould have appeared on the surface of one or two of the infusions containing $\frac{1}{4}$ grain of salicylic acid to the fluid ounce, and on the infusion of senna prepared April 25th, containing $\frac{1}{2}$ grain to the fluid ounce. At the time the specimens of lemon juice were transferred to other bottles they had been expressed more than three months; the juice had lost most of its odour, but had acquired no other. A few weeks before a slight flocculent precipitate began to fall in both, and this evidence of decomposition continues. It will be found that the aroma of most of the aromatic infusions is scarcely inferior to that of fresh preparations; the mucilage is perfectly fresh; the lemon juice free from mouldy or stale flavour, and the paste shows no symptom of decomposition.

So far, these experiments appear successful, but I now come to the record of disappointment and failure.

To specimens of freshly expressed juice of conium, hyoscyamus, and taraxacum, salicylic acid was added in proportions varying from $\frac{1}{4}$ grain to 1 grain to the fluid ounce. The juices in their natural condition and after coagulation and filtration were so treated, but all became bad within a few weeks,—some mouldy on the surface, others gradually lost their characteristic odour and taste without

much alteration in appearance. Other specimens, to which half the Pharmacopœia quantity of spirit and 1 grain of salicylic acid to the fluid ounce had been added, appear good after ten weeks' keeping, some improvement in the official method of preserving juices may therefore possibly be made in that direction, but I am not yet content to give up the hope that the costly and in many cases objectionable addition of alcohol may be altogether superseded.

The case of fresh infusions *versus* concentrated ditto has been many times before a pharmaceutical tribunal; and in almost every instance where the verdict has been in favour of concentrated preparations it has turned on the point that a good concentrated infusion is better than a bad "fresh" one, or the inconvenient alternative of keeping a patient waiting an hour or two for his medicine.

The above experiments seem to justify the conclusion that most of the Pharmacopœia infusions, mucilage of acacia, and lemon juice, may be preserved almost unimpaired for several months by the addition of $\frac{1}{2}$ a grain of salicylic acid to each fluid ounce. Infusion of senna seems to be an exception, for although the specimen on the table has been prepared four months, and was good until a few days ago, several other specimens treated with the same proportion of salicylic acid were bad in a few weeks. That such a small quantity of the acid produces no injurious effect on the system appears certain from the fact that 15 or 20 grains have been taken during the day without interfering with any of the functions of the body. That salicylic acid does not prevent, and only slightly retards, the action of pepsine I have proved by experiment.

A mixture consisting of 100 grains hard boiled white of egg, 2 grains Bullock & Reynolds' pepsine, 5 minims hydrochloric acid, and 1 fluid ounce of water, was prepared. To similar mixtures were added $\frac{1}{4}$ grain, $\frac{1}{2}$ grain, and 1 grain of salicylic acid, and the vessels marked No. 1, 2, 3, and 4. The whole were then maintained at a temperature of 98° F. for about six hours; at the end of this time the whole of the albumen had disappeared in No. 1, one grain remained undissolved in No. 2, two grains in No. 3, and five grains in No. 4.

Professor Salkowsky states (*Pharmaceutische Zeitung*, June 30th) that benzoic acid possesses greater antiseptic powers than salicylic acid. I have prepared a few infusions—buchu, orange, and gentian—with $\frac{1}{8}$ grain, $\frac{1}{4}$ grain, $\frac{1}{2}$ grain, and 1 grain of this substance to the fluid ounce. Those containing $\frac{1}{8}$ grain to the ounce had all spoiled in seven days. The others remain good at the present time, having

been prepared a month. They are as bright and aromatic as the day they were prepared. I have placed specimens on the table for examination. Added to white of egg and pepsine in the same proportions as in the salicylic acid experiments described above, benzoic acid seemed to retard the digestive process slightly longer.

Since the above was written and in the hands of the printer, Mr. Thresh has published in the *Pharmaceutical Journal* of September 4th, the results of some experiments he has been making to test the conservative power of salicylic acid when added to infusions, etc. Mr. Thresh's experiments only extend over a few weeks, but they help to show that less than half a grain of salicylic acid to the fluid ounce cannot be depended on.

Some of my infusions with one quarter of a grain to the ounce have kept much longer than those prepared by Mr. Thresh. The only difference in our *modus operandi* appears to be that he dissolved the acid in the water previous to making the infusion, and I dissolved it in the warm infusion after straining; my preparation would therefore probably contain a little more of the antiseptic than his.

The PRESIDENT said this paper was one of a practical nature; it came home to every pharmacist. Every one was interested in it whether he had any knowledge of the science of chemistry or not. The Conference would allow him to thank Mr. Bengier for the trouble he had taken. He had not heard previously that benzoic acid was a preventive of fermentation; it seemed to have more effect than salicylic acid.

Mr. WILLIAMS said it was most important we should have more information upon this most interesting subject. It had been asserted that salicylic acid would keep leeches alive, or rather prevent them dying so rapidly. Was it true? Of course leeches were not now so important as they used to be; still some were kept by most pharmacists.

Mr. THRESH said he had added salicylic acid to the water in which leeches were kept for about two months. About 100 leeches were kept in a half-gallon stone jar tied over with linen. This was washed out weekly, and generally one or two leeches were dead. Since adding a little aqueous solution of salicylic acid to the leech water not one leech had died, and the water had been always free from the odour it had gradually acquired without the acid. As an experiment, the water had not been changed for three or four

weeks, and it was as clear as it used to be at the end of one week without the acid. He thought salicylic acid would be more useful for making concentrated infusions than simple infusions.

Mr. GERRARD said he had made experiments similar to those made by Mr. Bengier, and had not found that salicylic acid had had the preservative effect he had mentioned. There was also a fatal objection to its use when perchloride of iron was prescribed; it became purple immediately. That would not do, so that in dispensing such prescriptions it could not be used, and they would have to fall back upon a simple infusion without acid. With reference to leeches, at the time he saw the note in the *Journal* there was a great mortality among the leeches in the institution where he was engaged, and he thought he would apply the suggestion. The weather was warm, and the water was being changed daily. He added a small quantity of acid in the proportion mentioned in the *Journal*, and repeated it from day to day, but the mortality went on; and so he therefore discontinued the use of the acid.

Mr. WALTER HILLS said he could corroborate what Mr. Gerrard had said. A friend of his had tried the addition of salicylic acid in the proportion mentioned in the *Journal*, but it seemed to kill the leeches rather faster.

The PRESIDENT said it might depend upon the proportion used.

Mr. GERRARD said he used the proportion mentioned in the *Journal*. It was very small. He did not dissolve it in glycerin. The purity of the acid might have had something to do with the result.

The PRESIDENT asked whether Mr. Gerrard had tried the effect of benzoic acid.

Mr. GERRARD said he had not. He did not know what effect the acid might have had if the leeches had not been in an unhealthy state and dying off rapidly.

The PRESIDENT said it might have kept them healthy without curing them when ill.

Mr. SIEBOLD said it had been pointed out that the acid does not interfere with the action of pepsine; but it was nevertheless probable that the acid might interfere with the process of digestion. If it were true that it prevented the action of diastase in the formation of sugar, he thought it would also interfere with the action of pancreatin.

Mr. SCHACHT said as other substances having an antiseptic power had been named, he would ask whether any gentleman had

any experience in the use of boracic acid. It had been recommended to be used in surgery, and one gentleman had reported very favourably of the results when so used. It naturally occurred in a discussion like this to suggest that it might be useful in such experiments as Mr. Bengier had described.

Professor ATTFIELD said it had been more than once stated that boracic acid was used for the preservation of milk. He had once found it present in a sample of milk. It would be interesting to know whether analysts generally had found it.

Mr. SAVAGE said he knew it had been extensively and successfully used by milkmen at Brighton, who found they could then keep milk for several days when otherwise they could not keep it as many hours.

Mr. SIEBOLD said boracic acid had been used extensively on the continent for the preservation of milk and meat. The same acid was the principal constituent of a preparation called "aseptin," which was largely sold in Germany. The antiseptic action of boracic acid was much weaker than that of salicylic or benzoic acid. He wished to draw attention to the value of benzoic acid for the preservation of meat. If the meat were cut up in small pieces, and placed in a weak solution of benzoic acid, it would keep for a very long time. Some had been kept in that way for three months; the meat remained perfectly good, and the liquid quite clear, and there was not the slightest indication of putridity or bad odour. He thought that this property of benzoic acid might be utilized for giving some degree of stability to one of the most important preparations of food used in pharmacy, viz., Liebig's cold-made infusion of beef, a preparation which was of inestimable value in the case of delicate children rejecting other kinds of food, and which had saved many a life. This preparation, however, was liable to spoil within twenty-four hours, and required to be made from fresh beef, which could not always be had the moment it was needed. By the addition of a small quantity of benzoic acid (about half a grain per ounce) this infusion kept very well for a week; whether it would keep even longer he had not yet tried. The experiment was well worth repeating, for if such a valuable preparation could be made to keep by the addition of so small a quantity of a harmless substance, it would indeed be a great boon.

Mr. EKIN said milk dealers were much indebted to chemistry; but the mention of this substance might have a prejudicial effect. [A Member: It is known all through the country.] The dealers in milk on a large scale already looked upon the public analysts, he

thought rightly, as their very best friends. The analysts had set up an arbitrary standard for milk, and the milk dealers on a large scale availed themselves of it. There was hardly an instance in which the milk was not toned down to the analysts' standard, and a large profit thereby made.

Mr. BICKERDIKE said the only substance to which salicylic acid could be compared was carbolic acid; and he should like to know whether the proportion of half a grain to the ounce was in all cases sufficient for the purposes of preservation. With carbolic acid, for most organic substances at all events, 1 in 500 would keep them sweet and unchanged.

The PRESIDENT said that a patent already existed for the preservation of meat by boracic acid accompanied by pressure. His brother when botanising in the Abruzzi, getting tired of hard boiled eggs, determined to take some meat with him, preserved by this method. It got mildewed at the top, but the rest remained good and wholesome.

Mr. BENDER said he had not tried carbolic acid; but salicylic acid in the proportion of half a grain to the ounce perfectly preserved infusions from three to four months, and several were kept with a quarter of a grain to the ounce.

Mr. YOUNG said that for many months Professor Lister had used boracic lint. When salicylic acid was first spoken of he had given it a fair trial; but he still gave the preference to carbolic. Boracic acid was found exceedingly useful in certain cases, and the sale of boracic lint had materially increased during the last eight or nine months. In answer to a question whether Mr. Lister used boracic acid in combination with carbolic, Mr. Young replied, No; alone.

Mr. MARTINDALE said boracic acid was of special use in cases of burns; it was much milder in its action as an antiseptic agent than carbolic acid.

Mr. GERRARD said he thought the specimen of paste exhibited a faint odour of carbolic acid.

The next paper read was a—

REPORT ON THE PURITY OF THE MAGNESIUM CARBONATES OF COMMERCE.

BY J. C. THRESH.

The list of subjects for investigation issued by the Conference includes one on the "Purity of the Ponderous, Semi-Ponderous,

and Light Carbonates of Magnesia." The semi-ponderous variety appears to be very little known, for I have not been able to procure a single sample. One parcel I did receive from a chemist in Lincolnshire, labelled "semi-ponderous," but I found it was the ordinary ponderous carbonate. My report, therefore, deals no further with it, but is confined to the seventy samples of light and heavy magnesium carbonates which I have obtained in various ways from wholesale and retail chemists, in England, Scotland, and Wales. By obtaining samples from such a diversity of sources, I have endeavoured to make them as representative as possible.

Before stating the results of my investigations, I may say that I was at first sorely puzzled as to the best method of detecting traces of calcium carbonate in presence of the magnesia. The method given in the P.B., of supersaturating an acid solution of the salt with ammonium hydrate and adding ammonium oxalate, is certainly not reliable as a qualitative test, since under certain circumstances unknown to me even dilute solutions of magnesia after standing a time deposit a crystalline compound of ammonium and magnesium oxalate. As a quantitative test it is, to say the least, tedious, since the precipitate must be dissolved and re-precipitated twice to free it completely from magnesia. In my experiments I adopted the following process for ascertaining the presence of lime and estimating the quantity. After igniting from 2 to 3 grams to determine the loss on ignition, I placed the resulting oxide in cold water, and after letting it stand a little while (say half an hour) the addition of oxalate of ammonium to the clear filtered solution gave a precipitate if the magnesium carbonate contained 1 per cent. of the calcium salt. I found also that by treating the oxide with water until the filtrate no longer gave a precipitate with oxalate of ammonium I could extract 98 per cent. of the calcium carbonate. In these experiments, when I added ground calc-spar, instead of the precipitated Ca CO_3 , to the pure magnesium salt, and heated the sample over the gas lamp, the residue when treated with water and filtered contained scarcely a trace of lime.

Of the seventy samples of carbonate examined, twenty-seven were the ponderous variety. None of these contained a trace of lead, but in six iron was detected in minute quantities. Several gave slight traces of alumina and fourteen traces of lime.

The calcium carbonate was estimated in four cases, and ranged from .3 to .7 per cent. Most of the samples contained traces of soluble salts, and eleven of them when boiled in water yielded an alkaline solution.

This explains its being so dense and granular, and at the same time shows how very carefully it had been prepared.

Leaving this exceptional sample of "home-made chemicals" out of the question, we may conclude that the condition of the heavy magnesium carbonates of commerce is satisfactory, inasmuch as they are free from all but the slightest trace of impurity, and correspond in composition with the official formula.

Of the light carbonate of magnesia I examined 43 samples, and I am sorry to say I cannot report so favourably upon them as I have of the heavy variety. None of these, however, contained a trace of lead, but only one was free from iron. The amount of this latter metal present varied from a minute trace to '35 per cent. (calculated as ferrous carbonate). I estimated the iron in several samples by titrating with permanganate of potash an acid solution of the carbonate, which had previously been treated with pure zinc in a current of CO_2 . In four samples the iron calculated as carbonate was '104, '20, '30, and '35 per cent. respectively. The alumina found in most of the samples varied in amount from the merest trace to '14 per cent. which was the most I obtained from the samples I quantitatively examined.

Calcium carbonate is the principal impurity in the light magnesium carbonate, only six being free from it, the remainder containing it in rather considerable proportions. Thus, in one sample I found 3'4 and in another 3'6 per cent., but the average of the others in which it was estimated was 1'005 per cent.

Much larger proportions of soluble salts were found in the light than in the heavy carbonates. The aqueous solution generally giving copious precipitates with either silver nitrate or barium chloride, and with ammonium phosphate and ammonia. Only in three cases was the reaction alkaline. One sample yielded 1'09 per cent. of sodium and magnesium sulphates, but it was an exception. The percentage of magnesium oxide obtained by calcination was in most cases 42 per cent., but several yielded a larger proportion owing to their having been dried at too high a temperature.

I have now only to remark upon one or two samples purchased as carbonate, but labelled "calcined" magnesia. They contained nearly 70 per cent. of MgO , and dissolved with difficulty in dilute acid. The amount of loss on ignition was greater than possibly could have been the case with calcined magnesia, however long exposed, and I concluded they were mixtures in about equal proportions of "calcined" and "carbonate." On making inquiries on the subject, I was informed by a chemist that it was a common practice to mix

the two, since the former when put up in packets ready for sale cakes together, or becomes lumpy, unless it has previously been mixed with the carbonate.

I tried the experiment and found that the admixture of a considerable proportion of carbonate did obviate the tendency of the calcined to "cake." I am assured this practice is not followed for the sake of obtaining an increased profit, but as it is an adulteration, it would be difficult to convince a magistrate that pecuniary motives were entirely absent, when the one is so much cheaper than the other.

The PRESIDENT said, this was a paper furnished in response to a question contained in the list of subjects for investigation; and the list had rarely produced better results than in this case. He thanked Mr. Thresh heartily for undertaking this investigation. The home-made samples were not quite so pure as they ought to have been the percentage of impurity was in some cases very large.

Mr. BRADY said he did not understand the difficulty in obtaining semi-ponderous magnesia. It was an article largely manufactured at Washington, and he would be glad to send Mr. Thresh a specimen of it.

Mr. THRESH said he applied to several of the principal London houses; they all said that the heavy and light carbonate of magnesia were the only two kinds they kept in stock. He would like to ask Mr. Brady whether he thought it possible to make the carbonate of magnesia on a large scale, without its containing traces of lime.

Mr. BRADY said that no two samples of magnesian limestone would yield precisely the same result by the same treatment, but that he believed the commercial product, whether light or heavy, as turned out by the leading manufacturers, was an almost chemically pure product. He could speak of the care exercised in the north country manufactory, and was certain that any batch containing an appreciable percentage of carbonate of lime would be sent back into the works. The heavy carbonate, as was well known, was now almost a monopoly; but the light carbonate and light calcined, were made on a very large scale, being used, especially the calcined, for many purposes in the arts as well as in medicine,—for instance, in the manufacture of some varieties of indiarubber.

Mr. WILLIAMS said that it was used largely in the clarification of olive oil.

Mr. TAIT stated that a case came under his own observation in

Edinburgh, in which a lady complained of the difficulty of getting Gregory's powder as supplied by his firm to mix with water, and at the same time supplying him with a specimen of that powder, as prepared by a chemist in London. He found that the lady was quite right; but, on adding some diluted hydrochloric acid, he ascertained that the London powder was partly, if not wholly, made with the heavy carbonate of magnesia, instead of the calcined, according to Dr. Gregory's formula, which he understood to correspond with the *pulvis rhei comp.* of the British Pharmacopœia.

The next paper was on—

CITRATE OF LITHIUM.

By C. UMNEY.

Citrate of lithium of trade is either in a crystalline or pulverulent form.

Its composition when crystalline is exceedingly uniform, but when in powder, as commonly met with in pharmacy, it varies considerably, and is dissimilar to the citrate of lithium of the British Pharmacopœia.

In order to test the suitability of the official proportions of citric acid and lithium carbonate for the production of neutral anhydrous lithium citrate, and to determine whether the *characters and tests* given in the Pharmacopœia were strictly accurate, and in addition to ascertain by the examination of trade specimens how far the requirements of the Pharmacopœia were complied with, the experiments upon which this communication is based were made.

The official process directs that to 160 parts of carbonate of lithium, 180 parts of citric acid should be used, but Squire ("Companion to the Pharmacopœia," p. 180) takes exception to this, and gives for 100 of carbonate, 200 parts of citric acid, which latter proportions have been accepted; for in the United States' Pharmacopœia, 1874, this ratio has been adopted.

Now neither by calculation nor in actual practice are either of these proportions correct.

Accepting the formula :—

$3 \text{ L}_2 \text{ C O}_3 + 2 (\text{H}_3 \text{ C}_6 \text{ H}_5 \text{ O}_7, \text{H}_2 \text{ O}) = 2 \text{ L}_3 \text{ C}_6 \text{ H}_5 \text{ O}_7 + 5 \text{ H}_2 \text{ O} + 3 \text{ C O}_2.$
 then 100 parts of carbonate of lithium will be required to neutralize 189.2 parts of citric acid, the product of anhydrous lithium citrate being identical with the amount of citric acid originally employed in the operation.

If commercial carbonate of lithium of fine quality contain 98.5

per cent. of real carbonate, then the proportions would be 100 parts of carbonate and 186.5 parts of citric acid.

Lithium citrate when prepared from these proportions and dried until anhydrous, was neutral to test paper, while a specimen made in accordance with the British Pharmacopœia was distinctly alkaline, and one by the United States' formula strongly acid, and much discoloured.

A solution of specific gravity 1.230 when set aside, produced * crystalline citrate of lithium, more generally used in pharmacy some fifteen or twenty years ago than at the present time.

The definition of "deliquescent," applied by the British and United States' Pharmacopœias to citrate of lithium, is (as remarked by Squire) inaccurate, and this can doubtless be confirmed by those accustomed to handle the salt.

Incineration, as a means of quantitative estimation, is given in both the Pharmacopœias referred to, the acid salt of the one, and the alkaline salt of the other, being both stated to yield the theoretical quantity of 53 per cent. of carbonate by ignition.

It is apparent that if different proportions of carbonate be used for the production of two citrates, as these Pharmacopœias direct, then the weight of the residues upon incineration cannot be identical, as stated, but must be in proportion to the weight of the original carbonate employed.

The theoretical quantity of carbonate cannot easily be obtained by incineration of lithium citrate, inasmuch as carbonate of lithium loses a portion of its carbonic acid at high temperatures, and becomes caustic.

In order to obtain approximate results it is advisable to subject the citrate to the minimum amount of heat, and to conduct the incineration rapidly.

The examination of trade specimens of lithium citrate indicates that not only do manufacturers regard the anhydrous salt as required by the Pharmacopœia as an unnecessary refinement, but they simply decline to attempt its production, for in no instance have I been able to procure specimens that contained more than 84 per cent., while those most generally met with do not exceed 74 per cent. of anhydrous citrate.

* Mr. Sandford has kindly favoured me with crystals made twenty years since, from proportions almost identical with those I have given. These crystals contain about 73 per cent. of anhydrous citrate of lithium, and correspond in all probability to the formula $\text{Li}_3 \text{C}_6 \text{H}_5 \text{O}_7 + 4 \text{H}_2 \text{O}$.

Lithium Citrate of Pharmacy.

Specimen.	Quantity taken.	Dried at 100°.	Dried at 115° (240° Fahr. B.P.), to produce the official citrate.
1	1 gram	·852 gram	·838 gram
2	„	·862	·821
3	„	·808	·745
4	„	·765	·747
5	„	·773	·741
6	„	·850	·828
7	„	·757	·739
8	„	·822	·803
9	„	·770	·733
10	„	·765	·729

It would seem from the above that the difference between citrate dried at 100° and 115° is about 5 per cent., corresponding to about one molecule of water; or in other words, if the formula for crystalline citrate of lithium be $\text{Li}_3\text{C}_6\text{H}_5\text{O}_7, 4\text{H}_2\text{O}$, then the salt dried at 100° will lose three of these four molecules of water. *

It is possible that the compilers of the 1864 British Pharmacopœia, in which citrate of lithium was first official, adopted the anhydrous citrate to lessen the objections to the salt on account of its supposed deliquescent character, and that in the 1867 edition the same was accepted as correct.

I cannot see why the crystals, which are thoroughly definite and reliable, should not be used in preference to anhydrous citrate; and if it be thought desirable to retain a salt containing less water than the crystals, then one dried at the temperature of a water bath would, in my opinion, be sufficient for all practical purposes.

The chief advantage likely to result from the adoption of the crystalline as the official form of citrate of lithium would be that its appearance would guarantee its uniformity, while the chief argument in favour of drying the citrate at the temperature of a water bath *only*, is that such a salt is more easy of manipulation, and can be prepared and retained under all circumstances of greater uniformity than one absolutely anhydrous.

The PRESIDENT said this was one of a series of valuable papers on articles in the Pharmacopœia which Mr. Umney had contributed. Citrate of lithium was greatly used, and it appeared to be unsatisfactory in its composition, varying sometimes to the extent of 10 or 20 per cent. He agreed with Mr. Umney that, provided his assertion were correct that the crystalline salt was not deliquescent, it

would be better to use the salt in that form rather than in an amorphous condition. He should like to ask whether benzoate of lithium had been tried; he had seen it strongly recommended in a continental journal.

Mr. WILLIAMS said benzoate of lithium was being extensively employed. He thought it was in America where it was principally used. It seemed to be an elegant and beautiful salt, and it was largely prepared for the foreign market. Having been a maker of citrate of lithium for many years, he should like to say that he considered the reason why crystals were not recommended originally in the Pharmacopœia was that it was found very difficult to produce them with uniformity and elegance when made on the small scale. Manufacturers know better now; but ten or fifteen years ago it was a difficult task. He did not think the anhydrous salt of the Pharmacopœia was practically so useful or convenient to prepare as the salt as usually sold containing one atom of water.

The PRESIDENT asked whether the crystals were deliquescent.

Mr. WILLIAMS said no; not when they are properly prepared. In fact, they were rather efflorescent.

Professor REDWOOD said he had been happy to hear it stated by two manufacturers that they now advocated the adoption of the crystalline form of this salt. When the Pharmacopœia of 1867 was under revision, the difficulty in the way of adopting the crystalline article originated with manufacturers; it was they who really stood in the way, and Mr. Williams had virtually admitted as much. There was one advocate of the crystalline form at that time, and that was Mr. Sandford, who had prepared it, and showed it could be prepared. Nevertheless, the manufacturers who were consulted objected to its being ordered in that form; and that was the reason why this and some other salts were left as they are ordered in the amorphous condition. He was glad manufacturers had altered their opinion, and were willing to admit that such articles should be ordered in a crystalline condition.

The next paper read was a—

NOTE ON THE CULTIVATION OF SAFFRON IN THE ABRUZZI.

By HENRY GROVES.

In this my third year's botanizing in the rugged Abruzzi, where hospitality retains its old and hearty form, and where the wealthiest landowners compete for the pleasure of entertaining strangers,

without inquiring how much they have in Consols, or caring to what exact stratum of society they may appertain, I have been led to pass through the saffron district, and now lay the result of my inquiries before my pharmaceutical brethren.

The Abruzzi, seen from a height, present the appearance of a vast sea of mountains, for here the Apennines present their grandest chain, with outlying ranges of an altitude varying from 7000 to 10,000 feet, and it is on the lower spurs of these mountains, at a height of from 2000 to 3000 feet, that the cultivation of saffron has been carried on for many generations. The mountains are calcareous, and, except to the botanist who has roamed them, present a very barren aspect, only relieved by the beech thickets which straggle up their flanks as far as the tree limit. These woods are frequently broken by the immense "ravari," or rubble slopes, which form conspicuous objects even at a distance, and with precipices which crown the higher mountains, combine to give the idea of a very land of stones, although pasture enough is found to feed all the numerous flocks of the Puglie during the summer months. Such is the picture of these mountains that overlook the saffron districts.

The cultivated ground commences below the beech thickets, and is but a little less stony than the ground above; however, corn and potatoes thrive well, and a little lower down the saffron plots are established. Here the stones are removed as much as is possible in a soil that consists of little else, and the ground is well trenched to a depth of half a metre, and prepared in August with animal manure, preferably that of sheep, so as to be ready for the planting of the bulbs in the following October. The bulbs are planted in ridges with intervening furrows, which, for economy of soil, are sown with corn, as this crop is gathered before the saffron flowers appear, and the furrows remain free as pathways for the gatherers; besides which they are so disposed as to drain the plot. Each ridge is about half a metre in width, and is planted with four or five rows of bulbs, which are placed so as to touch each other longitudinally, and are planted at a depth of ten centimetres, so that they are but just covered with earth. Nothing now remains but to keep the ground well weeded, and in the latter part of October and the whole of November the crop is gathered. For one season the bulbs will give out flowers when placed in a moist place even without earth. The gathering is done in the early morning, chiefly by women, who have wicker baskets on their arms and pass along the furrows plucking the whole flower, which is carried home, and the stigmata removed at leisure. These baskets are renewed yearly, a local fair being held

for that purpose, and after the gathering they are condemned to serve general household purposes. Several flowers usually grow from one bulb, in some instances as many as ten or twelve. Once planted, the saffron plots remain good for two years, at the end of which time they are dug up, and in the third year are planted with corn, after which they may be used again for saffron, although they seek to keep the plots shifting as much as possible. When the old ground is dug up, the bulbs first planted are already wasted, and only the reticulated tunics remain, by the side of which are found the new bulbs. These are taken home and selected, the larger ones for replanting, and the smaller ones, with the remains of the old ones, are given to the cows as fodder, to which they are very partial. Nor are the cows the only lovers of saffron bulbs, for the field mice would commit great havoc were they not looked after by the peasants, who keep small guns and traps constantly in the fields. The trap employed is the usual spring trap which catches the mouse by the neck, but instead of four or six holes, they have ten. The market price of good bulbs is about five lire or francs the "salma," which equals three "tomoli," or 167 litres. Although saffron grounds are to be found here and there throughout the Abruzzi, the chief centres are towards the valley of the Acerno in the neighbourhood of Barisciano, San Demetrio, San Pio delle Camere, Collepreto, Navelli, Caporciano, San Nicandro, San Mito, and Castel del Monte, where the cultivation is carried out on a grand scale, many of the wealthy landowners owing their position to saffron dealing, which in reality is speculation, as the price per kilo ranges from one hundred to three hundred lire. The poorer cultivators sell at the price of the year, but the richer dealers set aside their saffron in tins if the price does not suit them. Some seasons have yielded such profits that one year's harvest has surpassed the value of the land under cultivation; at others the cultivation would have ceased were not the beds of two years' duration, and consequently no expense is entailed to wait the result of a second season.

The adulteration of saffron is carried out in various ways, the chief one being by mixing with it shredded beef, of which a suitable piece is boiled and then shredded into small fibres which are stained with saffron water and then dried. The filaments of the stamens are also dyed in the same manner, and intermixed. To make the saffron water, about fifteen grams of the stigmata are tied up in a cloth, and soaked with a little water or wine, which after a time is pressed out, and the process repeated as long as any colouring matter remains. The exhausted saffron is used by the country

people in their polenta, to which it imparts some slight flavour. Another adulterant is an almost impalpable yellow earth found here and there in the mountains; and finally, before taking the product to market, it is damped with wine or water. Dealers accustomed to buying saffron avoid these adulterated specimens, so that the Aquilan or Abruzzi quality rules higher than any other kind, not excepting that of Spain.

After the thanks of the Conference had been awarded to Mr. H. Groves,

Mr. WILLIAMS said it would be interesting to know whether the colour of saffron was affected by rain. It was believed that the feathers of certain birds lost their colour unless the feathers were kept well oiled; and that if the bird were prevented oiling its feathers, the rain would wash out brilliant and delicate colours. He should like Mr. Groves to be asked whether the rain washed the colour out of the stigmas of the growing plant.

ADULTERATED MUSK.

Mr. BLANCHARD said he had had sent to him half a dozen samples of musk; and in that expensive article two pods were discovered to be adulterated.

Mr. UMNEY said the musk brokers placed musk before the wholesale dealers in four distinct piles; the lowest of which was sold at about 14s. an ounce, and the finest at 40s., and upwards. He should like to know from which pile the samples were taken. That from pile No. 4 could not be expected to equal that from pile No. 1 when these numbers were originally placed as being indicative of quality.

Mr. BLANCHARD said it was offered to him by a first-rate broker as excellent musk; he thought the price moderate, and bought some of it.

The Conference then adjourned until the Wednesday.

Wednesday, August 25th.

Professor ATTFIELD read the following list of names of persons proposed for membership:—

- Alcock, H. (Coventry).
- Bickerdike, W. E., F.C.S. (Church).
- Brattley, F. (London).
- Bullock, Lloyd, F.C.S. (London).
- Churchouse, W. J. F. (Chard).

Cowan, W. M., F.C.S. (Greenock).
Driver, A. (Clifton).
Frankland, Dr. E., F.R.S. (London).
Fardon, H. (Bristol).
Freestone, T. (Bristol).
Glassford, J. McL., F.C.S. (London).
Gardner, W. (Bristol).
Hobson, A. S., F.C.S. (London).
Hume, J. W. D. (Gloucester).
Jennings, F. M., F.C.S. (Cork).
Jennings, T. H. (Bristol).
Jones, E. W. T., F.C.S. (Wolverhampton).
Kinch, E., F.C.S. (London).
Kinzett, C. T., F.C.S. (London).
Lindsay, T., F.C.S. (Glasgow).
Martin, R. (Bolton).
Matthias, J. J., (Weston-super-Mare).
Newton, T. A. C. (London).
Odling, Prof. W., F.R.S. (Oxford).
Plumley, J. J. (Bristol).
Pridmore, W. (Hinckley).
Pugh, H. (Llanegryn).
Richardson, Dr. B. W., F.R.S. (London).
Savory, A. L. (Bath).
Savory, J. F. (Clifton).
Schorlemmer, Prof. C., F.R.S. (Manchester).
Smith, A. P., F.C.S. (Rugby).
Stevenson, Dr. T., F.C.S. (London).
Stewart, A. Y. (London).
Stewart, G. C., F.C.S. (Greenock).
Stroud, J. (Bristol).
Thompson, Dr. R. E., F.C.S. (London).
Thomson, W., F.C.S. (Manchester).
Tod, J. (Coventry).
Tritton, C. (Bristol).
Wheeler, J. W. (London).
Whewell, G., F.C.S. (Blackburn).
White, J. W. (Clifton).
Wiltshire, T. P., F.C.S., M.R.A.C. (Widnes).
Woodcock, R. C., F.C.S. (Cirencester).

These gentlemen were unanimously elected.

Mr. GREENISH proposed the name of Professor Dragendorff as an honorary member. He said Professor Dragendorff was professor at the Dorpat University in Russia, and had an European reputation; there could scarcely be any pharmacist to whom his name was unfamiliar. He was sure this Conference would gladly receive papers from him.

Mr. BRADY had great pleasure in seconding the nomination.

The motion was agreed to unanimously.

The first paper read on Wednesday was a—

NOTE ON CHLOROFORM WATER.

By T. B. GROVES.

On January 13, this year, my assistant was preparing a mixture containing sulphate of quinine, iodide of potassium, and chloroform water. He did it by dissolving the crystallized acid sulphate of quinine in chloroform water, and then adding the iodide in mass. Soon afterwards a varnish-like precipitate of iodide of quinine having made its appearance, the liquid was decanted, and the iodide having been dissolved in a little dilute sulphuric acid, the bottle was refilled with its previous contents. Very shortly afterwards a red cloudiness was observed, which rapidly increased until a considerable precipitate had formed. This after a short time assumed the form of crystalline plates which when placed under the microscope were recognized by their tourmaline effects as those of herapathite.

The mixture was made a second time, the iodide of potassium being added last in strong solution, and the same result was obtained. When, however, the iodide was added in weak solution, and the mixture was kept well stirred, the formation of herapathite did not take place.

The chloroform water had, I ascertained, been made some six months previously, hence this unexpected result. It had, however, every appearance and taste of freshness, and when added to starch mucilage and iodide of potassium did not develop a blue colour. The iodide of potassium was not found to contain an appreciable trace of iodate, which, supposing the chloroform water to have been acid might have accounted for the liberation of free iodine and the production of herapathite.

The mixture made with freshly prepared chloroform water retained its transparency and colourlessness, but on adding to it a little perchloride of iron, herapathite was at once precipitated. The

same, of course, occurred when pure water was substituted for chloroform water, but in the latter case it was observed that many of the crystals were in the form of stout needles and were opaque.

In order to observe the time required to produce this change of condition in chloroform water, and, if possible, to ascertain its nature, a quantity of it was prepared on the 16th of January, and set aside in a stoppered bottle, partly filled, and exposed to diffuse daylight in the laboratory, where the temperature never varied more than ten degrees. The stopper of the bottle was occasionally removed, and its contents shaken.

Tested on the day it was made no result was observed, but on leaving some of the mixture for a day or two exposed to the air in an open tube, it was found that a few crystalline plates of herapathite had been deposited. The testing was repeated from time to time. On February 6th, some of the mixture was set aside in an open tube, and by the side of it, exposed to the same conditions, was placed a tube containing a similar mixture in which pure water was substituted for chloroform water. A fortnight after, the first was found to contain a rather considerable crystallization, the latter was apparently unaltered. May 12th, no immediate result was obtained, and on exposing the mixture it became yellow in colour, but deposited no crystals. Tested with starch mucilage the colour was found to be due to free iodine. This reaction was observed on several occasions; sometimes a development of crystals accompanied the liberation of iodine.

The experiments were continued up to August 17th, when after varying the mode of mixing in every way it was found that the original instantaneous reaction could not be repeated.

The chloroform water was at that date neutral to litmus paper, and could not be found to be perceptibly altered in any way. I cannot account for the original reaction except by supposing that the chloroform of which the water had been made was impure, and that it had acquired, by being kept for a long time in contact with water and air, an ozonized condition. Its failing to react on iodide of potassium and starch showed that it did not contain free chlorine, or any chlorous body capable of liberating iodine from its potassic combination.

Professor ATTFIELD said he could understand one possible mode in which these herapathite crystals might have been formed somewhat slowly; but he did not understand how they could have been formed instantly. He had occasionally, once or twice, within the

last few years met with samples of chloroform containing a little moisture and traces of hydrochloric acid, which would liberate hydriodic acid from the iodide of potassium, and, slowly, the air would act on the hydriodic acid liberating iodine. There would then be present all the elements for the formation of iodoquinine: but how it was to occur instantaneously he did not understand.

On the motion of Mr. Schacht the President was thanked for his communication.

The next paper read was a—

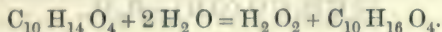
SUMMARY OF RESEARCHES ON THE LIMITED OXIDATION OF THE ESSENTIAL OILS.

BY CHARLES T. KINGZETT, F.C.S., ETC.

These researches originated during an investigation of the supposed production of ozone by the slow oxidation of various bodies, and I was led to study more especially the oxidation of oil of turpentine, the results of which examination were communicated to the Chemical Society in two parts (*Journ. Chem. Soc.*, 2nd series, xii., 511, and xiii., 210). In the third part of this research, I have generalized this method of experiment to the members of the several families of terpenes, and to cymene.

My results prove, that by oxidation of turpentine atmospherically, ozone is most certainly *not* produced, neither is peroxide of hydrogen as a direct product, but that an additive compound—an organic peroxide—is formed, which, on treatment with water, yields peroxide of hydrogen. If the oxidation, therefore, is effected in the presence of water, peroxide of hydrogen is found in the aqueous solution, but beyond doubt it results as a decomposition product, as above stated.

Side by side with the peroxide of hydrogen is found camphoric acid, both bodies having been established by analysis, etc., and I have suggested that they are formed from the action of water on camphoric peroxide.



Brodie has by his researches on organic peroxides demonstrated the existence of camphoric peroxide, but my attempts to produce this compound in the free state synthetically have not been successful.

I should state here, that the limited oxidation of the essential oils

or of the terpenes peculiar to them, may be effected in two ways, either by simple exposure of the body with or without water to air and sunshine, or by the passage of a current of air at about 40° C.

The oils of nutmeg, caraway, bergamot, juniper, cubeba, lemon, and chamomile, absorb oxygen from the air, producing in the presence of water, peroxide of hydrogen, but whether this is true also of their peculiar terpenes I have not in all cases determined.

But so far as I have examined, *all terpenes represented by the formula $C_{10}H_{16}$ give under the afore-stated conditions peroxide of hydrogen.* This, I have proved to be true of the terpenes of the oils of turpentine, nutmeg, orange peel, and wormwood.

It would further appear *that terpenes of the formula $C_{15}H_{24}$ do not produce peroxide of hydrogen* in this way. This at least is true of the terpene of oil of cloves, isolated by Church and proved by him to have that formula. Patchouli, another member of this family, apparently fails also to yield hydric peroxide.

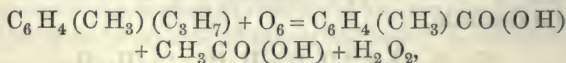
The remaining class of terpenes, viz., those of the formula $C_{20}H_{32}$, I have not yet examined.

Cymene from all sources is identical, as proved by the researches of Fittica, Wright, Paterno, and other chemists. I have examined cymene from camphor, from cajeputol, and from oil of nutmeg, and all three gave parallel results, that is, they produced peroxide of hydrogen in estimable quantities when oxidized in the presence of water, and evidence was obtained also of the formation of a toluic acid. There was not sufficient material to establish this last named point by analysis.

Thus another proof is afforded of the fact that cymene constitutes the nucleus form of matter of the terpenes of $C_{10}H_{16}$ formula, and it appears that in the $C_{15}H_{24}$ bodies the carbon exists in an allotropic condition.

Fittica regards cymene as normal methyl propyl benzene, in which the methyl and propyl occupy the *para* position.

Its atmospheric oxidation may possibly be expressed thus—



obtaining acetic and a toluic acids and peroxide of hydrogen.

When dilute nitric acid is employed as the oxidant, paratoluic acid is formed, but no peroxide of hydrogen; and when the oxidant is stronger, terephthalic acid is produced, together with acetic acid which is formed in all three cases.

The production of hydric peroxide from cymene is another bond of connection between the terpenes and the benzene series, and serves as an important diagnosis between terpenes which contain the cymene nucleus, and terpenes which do not.

It is of interest here to note the formation of valeric acid by the limited oxidation of amylene with dilute chromic acid (Berthelot, *Compt. Rend.*, lxxix., 1435-1442). When stronger oxidants are employed, valeric acid is not produced but more oxidized acids. I venture to think that the results I have obtained in my researches and the results of other chemists in various directions will ultimately lead to a great modification of the views of the constitution of hydrocarbons now generally entertained.

It is to be noted that in what has gone before, the word "terpene" has been used to designate certain bodies having relations to each other, although those relations are but little understood. Literally however, the three classes of bodies represented by the formulæ $C_{10}H_{16}$, $C_{15}H_{24}$, and $C_{20}H_{32}$, belong to three different series. Thus, $C_{10}H_{16}$ is a member of C_nH_{2n-4} series, while $C_{15}H_{24}$ is a member of C_nH_{2n-6} series, and $C_{20}H_{32}$ belongs to a series represented by C_nH_{2n-8} . But these different bodies are beyond doubt interrelated, for $C_{20}H_{32}$ can be obtained from $C_{10}H_{16}$ by the action of sulphuric acid, and there is reason to believe $C_{15}H_{24}$ to be likewise related to $C_{10}H_{16}$.

The PRESIDENT said no doubt this was an excellent paper. It dealt with a high class of chemistry; almost too high, he was afraid, for the majority of those whom he was addressing; it was certainly too high for him to discuss it off hand. The results were interesting, and might be practically useful to pharmacists by enabling them to identify essential oils, and detect admixtures and adulterations. He was not in a position to discuss the paper now, and would therefore only offer the thanks of the Conference to the author for bringing it forward.

Professor ATFIELD said he agreed that the thanks of the meeting were quite due to the author for his kindness in giving this *résumé* of the researches already made, as well as original matter which had not been published till then. It was known that the constitution of essential oils had interested the Conference since its establishment. One of the first questions submitted in the list of subjects for research issued by the Conference was that of rare essential oils, and twenty were mentioned, of which we had little or no knowledge respecting their chemistry. Since then Dr. Wright and now Mr.

Kingzett had made researches respecting them which must be extremely valuable. Though the utility of these researches might not be apparent to all pharmacists at first sight, still it was unquestioned that all observations of the kind must prove useful, inasmuch as every truth must have its use. There were still essential oils of which information was desired; the list in the circular of subjects for research was very large. He hoped Mr. Kingzett would continue his investigations, which he was obviously so well able to do, and would give the results at future meetings. Perhaps it was not generally known to members of the Conference, that in addition to the grants made from the Bell and Hills fund to members in aid of research, the Conference had now a balance of funds quite available for grants to gentlemen who might be anxious to make investigations. And not only investigations which were extremely expensive, as some of these would be, but any investigations in which the materials were costly, and where a considerable sum might have to be spent in the purchase of them. He could not conceive any question more fitted for a grant than the examination of essential oils. Were he working at them, he should, as a matter of principle, apply for a grant in aid. It was in such directions that the Conference was anxious to expend its surplus income.

Mr. ROBBINS said this was an interesting paper, well adapted to the Pharmaceutical Conference; and the subject was one the investigation of which might produce valuable results. He did not know whether the experiments of Dr. Day, of Geelong, were known in this country. Dr. Day had spent several years in the investigation of the action of essential oils, and had found all the oils he had examined to produce peroxide of hydrogen by long keeping, and some produced it in very large quantities; the oil which produced it in the largest quantity was the eucalyptus oil. By means of this product he claimed that he could destroy all poisonous matter, such as the virus of small-pox; in fact he believed he could destroy all poisons. Vaccine matter might be destroyed by it so as to cease to act; therefore Dr. Day believed he could get rid of small-pox altogether by the application to the patients of an ozonized ointment, made with the highly oxidized essential oils, or still better with ozonic ether, in the proportion of one dram to the ounce of lard, contact with which destroys all poisonous matter. Dr. Day had also read, a short time ago, before the Medical Society of Geelong, a paper in which he recommends that turpentine, eucalyptus oil, or kerosene, should be spread on canvas near hospitals; by that means he hoped to get rid of the spread of contagious diseases. Dr.

Day had been investigating the subject for several years, and the result of his experiments had been published in the Australian medical journals.

Mr. KINGZETT said he should feel obliged by the loan of the journals. He knew indirectly of Dr. Day's work from an English book, in which the facts stated were truly astonishing. In no case, however, was peroxide of hydrogen directly produced by the oxidation of an essential oil, but an organic peroxide. There was no such thing as antozone as a specific substance; what was so called was peroxide of hydrogen, and this resulted only when the oxidized product was treated with water. As to the medical issues, Mr. Kingzett said experiments were already being made, though he was not yet in a position to state the results. Mr. Kingzett remarked that terebene was the name of turpentine that had been subjected to the action of sulphuric acid. He was somewhat amused to find an article on sale under the title of "Terebene, the New Antiseptic." He had purchased a pint bottle for two shillings, and had examined it with some interest. That turpentine has an antiseptic value, is knowledge almost as old as the hills, but that this so-called terebene had a greater or even equal value he was not prepared to admit. It might be regarded as turpentine which had undergone some treatment which robbed it of its most important character as an antiseptic, viz., its power to produce peroxide of hydrogen. Moreover such an antiseptic had several great objections to its use; thus its oily nature, its odour, and above all things its inflammable character, would militate against its employment.

Mr. MARTINDALE said it had a distinct odour. He had not examined it carefully, but he thought the turpentine must have been treated with sulphuric acid. It had the odour of freshly sawn fir, or of pine oil.

Mr. WILLIAMS said this was really a curious substance well worthy of further investigation. Terebene was produced by the action of sulphuric acid upon turpentine, which underwent apparently an isomeric change; there being no combination between the two in any way. It was described in Watts' Dictionary, but not so clearly that its nature could be readily understood. Now that chemists had commenced working upon the subject, more would soon be known concerning it. In the meantime, true terebene could be procured by those who wished to experiment upon it. The action of the sulphuric acid upon the turpentine was very energetic. A small quantity only of sulphuric acid was used, no chemical union occurred, but the change in the turpentine appeared to be

purely a molecular one, produced by contact with another substance.

The next paper read was entitled—

A CHEMICAL RESEARCH UPON JABORANDI.

BY A. W. GERRARD,

Teacher of Pharmacy to University College Hospital.

Of recent introductions to the catalogue of European materia medica, there are, I consider, none presenting more interesting features for the study of the chemist and therapist than the drug known as "jaborandi," a plant of the natural order Rutaceæ, and said to be the *Pilocarpus pennatifolius* of Lemaire.

About eighteen months ago, Dr. Coutinho, in the *Répertoire de Pharmacie*, vol. ii., page 171, first brought it before the notice of the French faculty, describing it as a powerful diaphoretic and sialogogue. In the same communication he mentions the verification of his statements by Professor Gubler, who had administered the drug several times in the Beaujon Hospital, whereof he states that "this Brazilian plant, forwarded by Dr. Coutinho, will be the first indisputable example of a diaphoretic truly worthy of the name." Following this was a paper in *L'Union Pharmaceutique*, by M. Rabuteau, detailing a chemical examination of the leaves of jaborandi. An abstract of this paper is given in the *Pharmaceutical Journal* of May 16, 1874. The conclusions arrived at by the author, after submitting the leaves to distillation, and the action of alkaloidal reagents, were, "that jaborandi leaves have an odour due to a volatile principle which is not analogous to the essential oils contained in aromatic plants; it has a bitter taste, due to a principle soluble in water and in alcohol; lastly, the leaves do not appear to contain any alkaloid." The author, however, did not consider the investigation conclusive, by reason of the small amount of leaves operated upon.

The first general intimation of the presence of jaborandi in this country was at an evening meeting of the Pharmaceutical Society, November 4, 1874, when Mr. Martindale exhibited a specimen of the leaves, making a few remarks thereon. Again, in the *Pharmaceutical Journal* of January 16, 1875, Mr. Martindale gives an interesting account of a self-administered dose of the leaves, on which occasion, besides its usual action, he was the first to observe its effect upon the vision. At this time Dr. Sidney Ringer instituted some therapeutic investigations upon the drug; the results were pub-

lished in the medical journals, and fully bore out the statements that had previously been made as to its extraordinary properties. The pharmaceutical preparations of jaborandi used by Dr. Ringer in his experiments being prepared by me brought the drug frequently under my notice, enabling me to make observations which induced me to undertake some experiments with the view of testing whether the plant really contained an alkaloid, as after the statement of Rabuteau it appeared doubtful.

Whilst pursuing my investigations, an abstract of a paper by M. Byasson, taken from the *Répertoire de Pharmacie*, appeared in the *Pharmaceutical Journal* of April 17th of this year, entitled "A Chemical Examination of Jaborandi." The author reported the isolation of a small quantity of alkaloidal substance, sufficient to cause salivation when injected into the veins of a dog. The conclusions M. Byasson arrived at are as follows: "That the active principle in jaborandi leaves is a viscous aromatic alkaloid having an acrid bitter taste, and capable on distillation of being carried over like nicotine by the vapour of water in the presence of ammonia." This communication possessed a character of vagueness, and experiments I have made by distillation of the plant and also the alkaloid in the presence of ammonia, and examination of the distillate, failed to show any trace of alkaloid.

My first report of experiments upon jaborandi was published in the *Pharmaceutical Journal* of May 1st of this year; I then detailed the process by which I obtained a pale soft uncrystalline alkaloid, possessing well-marked reactions. This upon administration in $\frac{1}{2}$ -grain dose produced the full effects of the drug; at Mr. Holmes's suggestion I named it "pilocarpine," the name of "jaborandine" having been already appropriated to a substance obtained from a piperaceous plant. Again, in the *Pharmaceutical Journal* of June the 5th, I communicated the preparation of salts of the alkaloid of jaborandi, viz.: the nitrate, hydrochlorate, and sulphate, the two former yielding themselves crystalline, the nitrate being best defined.

The last report with which I am acquainted upon jaborandi is a communication to the *Répertoire de Pharmacie* of the 25th of June of this year, entitled "On the Composition of Jaborandi," by M. Ernest Hardy. The author describes a method by which he obtained an alkaloid, which he, like myself, names pilocarpine; his process of obtaining it differed entirely from that made use of by me, although I have no doubt from a description of its properties our alkaloids are identical. M. Hardy also mentions, that the plant con-

tains a volatile acid and a second crystalline alkaloid. As to the acid the statement is correct, but from a study of the method by which he obtained the second crystalline substance and a comparison with my own observations, I believe it to have been none other than chloride of potassium, which is abundant in the plant, and can be easily separated. That the plant may contain a second alkaloid is very probable. M. Hardy states that he communicated his experiments to the Société de Biologie, on the 13th March, 1875.

My investigations hitherto had been carried on upon small portions of the leaf and bark of jaborandi; being desirous of continuing them I was enabled, by the liberality of the British Pharmaceutical Conference, to obtain a supply of four pounds of leaf and two pounds of bark which I submitted to the following treatment:—Two pounds of powdered leaf was exhausted with 80 per cent. of alcohol, the alcohol recovered by distillation, and the residue, a dark green extract, was washed with water until the water passed void of bitterness; the insoluble portion was set aside, and marked "1st alcoholic residue." The bitter watery solution, which possessed an acid reaction, was now evaporated to a soft extract, and ammonia added in slight excess; this was shaken with three separate portions of chloroform; the chloroform, upon removal and evaporation, yielded 2 drams and 4 grains of impure alkaloid, of a pale green colour and syrupy consistence; the portion not taken up by chloroform was marked "2nd alcoholic residue." The impure alkaloid I now dissolved in water, and neutralized with nitric acid; this treatment dissolved two thirds of the substance, the insoluble third was marked "3rd alcoholic residue." The solution now containing the nitrate of pilocarpine was passed twice through animal charcoal, evaporated to a small bulk, and set aside to crystallize; in two days it had yielded 56 grains of pale brown-coloured crystals. This yield of alkaloid is very small, and must not be taken as the average percentage to be obtained from the leaves; the reason of the small quantity obtained is due to the well-known absorptive and retentive powers of animal charcoal upon these substances.

The remaining two pounds of leaves were exhausted of their bitterness with distilled water, the solution evaporated over a water-bath to a fluid extract; to this an equal volume of alcohol was added, which precipitated a large amount of albuminous and crystalline matter; this was separated, and marked "1st aqueous residue." The remaining solution was evaporated to a small bulk, and set aside to cool; upon examination, an abundant mass of crystals had formed, which I separated, and marked "2nd aqueous residue."

To the solution ammonia was added in slight excess; it was then treated with three portions of chloroform, which upon subsidence, removal, and evaporation, gave 110 grains of impure pilocarpine; this I converted into hydrochlorate, and it yielded, after treatment with animal charcoal, which decolourised it indifferently, 63 grains of moist crystals of a deliquescent character, becoming solid or liquid as governed by atmospheric changes.

The two pounds of jaborandi bark was treated in a similar manner to the last leaves; it yielded two residues, which I marked "1st and 2nd bark residues." The resulting alkaloid was converted into nitrate, and yielded without treatment with animal charcoal 107 grains of impure brown-coloured crystals; from this the alkaloid was again liberated with ammonia, and removed with chloroform it yielded 62 grains of pale brown-coloured alkaloid, which I reserved for the following experiments.

Small portions of pilocarpine were dissolved in water, alcohol, and chloroform, and allowed to evaporate slowly; examined from time to time, at the end of a month they showed no trace of crystallization; the remaining alkaloid was subjected to the action of colour reagents and other chemical substances with the following results:—

Reagents.	Precipitate.	Colour.
Acid, Sulphuric	None	Brownish Black.
" Nitric	"	Faint Pink.
" Hydrochloric	"	None.
" Phosph. Syrupy	"	Faint Pink.
" Chromic	"	None.
" Tannic	Some	White.
Liquor Potassæ	None	None.
" Ammoniæ	"	"
" Sodæ	"	"
Sulphuric Acid and Bichromate of Pot.	"	Emerald Green.
Iodine	"	None.
Bromine	"	"
Perchloride of Iron	"	"
Sulphocyanide of Potassium	"	"
Iodide of Potassium	"	"
Perchloride of Mercury	Some	White.
Iodo-hydrargyrate of Potassium	"	"
Phosphomolybdate of Soda	None	None.
Phosphomolybdate of Ammonia	"	"
Perchloride of Gold	Some	Yellow Crystalline.
" Platinum	"	"
Chlorine	None	None.

My attention was next directed to an examination of the various residues.

First Alcoholic Residue.—This, consisting principally of resinous oil and colouring matters, was added to water and distilled; the distillate upon examination had a peculiar aromatic odour characteristic of the plant. Upon its surface were floating numerous oily globules; these were separated and found to be solid. Placed upon a watch glass the heat of the hand immediately dissolved them, on cooling them they again solidified. A portion of this substance was placed upon a glass slide and examined under a microscope; although solid I observed no trace of crystalline form. Small portions were treated with caustic alkalies without any visible effect. From its solid character I am inclined to consider it a stearopten. The watery solution from which this oil was removed possessed an acid reaction; a volatile acid had therefore passed over, which the time at my disposal would not allow me to examine.

Second Alcoholic Residue.—This consisted of a mass of crystals imbedded in a dark-coloured viscid extractive. Portions of the crystals were separated, purified, and examined; they proved to be chloride of potassium, and this is the substance, as I have before stated, which I have good reason to believe M. Ernest Hardy has mistaken for a second alkaloid.

Third Alcoholic Residue.—This it may be remembered was an insoluble portion remaining after neutralizing the impure alkaloid with nitric acid; it had a powerfully bitter aromatic taste, was soluble in alcohol, ether, and chloroform, also in alkalies; treated with an excess of diluted nitric acid, and the resulting solution filtered and evaporated, it yielded an acid crystalline salt, having alkaloidal characteristics. To what extent this substance may differ from pilocarpine, or whether it may be identical with it, I cannot say, but this is certain, that after neutralizing the mother liquor with nitric acid, and removing the neutral nitrate of pilocarpine, a second crop of crystals can be obtained on treating the residue with an excess of nitric acid. This new substance has neither been examined chemically or physiologically; it is therefore interesting matter for further research.

First Aqueous Residue.—This was composed of starch, albumen, and chloride of potassium.

Second Aqueous Residue.—This consisted of a large proportion of chloride of potassium, some tannic acid, and the unknown volatile acid previously mentioned.

The bark residues were not examined, as the essentials are I believe identical with those obtained from the leaves.

The practical results to be deduced from the preceding investiga-

tion may be enumerated as follows:—That the jaborandi known as *Pilocarpus pennatifolius* possesses a complex composition including an alkaloid possessed of well-marked chemical and physiological properties, which is itself non-crystalline, but is capable of forming with acids crystalline salts. Jaborandi also contains a probably second alkaloid, forming acid salts. Besides these are present an aromatic essential oil, solid at ordinary temperatures, tannic acid, a peculiar volatile acid, and chloride of potassium.

The uses and position this new remedy will obtain for itself in materia medica it is not my province to dwell upon; this matter is being studied by universal therapeutic investigators, and I trust, and am certain, that any assistance they may claim from pharmaceutical science will be freely rendered.

This was followed by the reading of—

A REPORT UPON THE PHYSIOLOGICAL ACTION OF AN ALKALOID OBTAINED FROM JABORANDI.

BY WILLIAM MURRELL, F.R.C.P.

I have made, under the superintendence of Dr. Burdon Sanderson several experiments in the physiological laboratory of University College, on an alkaloid obtained by Mr. Gerrard from jaborandi.

A $\frac{1}{10}$ th grain dissolved in a few drops of water and injected into the jugular vein produced profuse salivation in a dog and rabbit which had been rendered insensible by chloral and morphia. In the rabbit the salivation commenced five minutes after the injection, and in the dog (a small black and tan) the effect was almost instantaneous, the viscid saliva at the expiration of two minutes running freely from the mouth. In both animals the flow continued for over an hour, but was readily arrested by the injection of gr. $\frac{1}{20}$ of sulphate of atropine. In the dog especial attention was paid to the condition of the skin, but there was no increase in its secretion, a result which excites no surprise when the difficulty and rarity with which dogs ordinarily perspire is taken into consideration. In both animals the injection caused a retardation of the heart's action, and had a marked influence on the blood pressure.

The effect of the drug upon the lower animals was equally apparent. In frogs the subcutaneous injection of $\frac{1}{2}$ grain produced powerful tetanic symptoms, comparable to those resulting from the administration of strychnia. The tetanus was extremely powerful,

the animal in several instances being jerked completely off the table. It was usually produced in from a quarter of an hour to an hour from the injection of the drug, and after its first appearance a paroxysm could be readily excited by the slightest touch, sometimes even by a breath of air; the injection of $\frac{1}{4}$ or $\frac{1}{8}$ grain was followed by the production of similar phenomena, although their appearance was longer delayed. Death usually resulted in from two to three hours, often in a much shorter time.

Smaller doses (gr. $\frac{1}{8}$ to $\frac{1}{60}$) produced no tetanus, but caused well-marked neurotic symptoms, which proved fatal in from six to twelve hours. The gr. $\frac{1}{60}$ was the smallest dose which in the frog produced definite results. The gr. $\frac{1}{100}$ was in several experiments found to have no effect on the animal. In frogs the drug, even in the smallest doses, produced an extremely viscid condition of the skin, but no salivation.

The drug proved equally fatal to animals still lower in the scale. A fly was immersed for a few seconds in a 1 in 50 solution of the alkaloid. On being removed its wings were wet and impeded its movements. When dry the animal was placed upon the table, and soon commenced crawling about, its movements being slow and unsteady, and no attempt to escape being made. On being thrown in the air there was no effort to fly. A slight breath sufficed to blow it over on its back, where it appeared to be quite incapable of retaining its normal position. It died in about three quarters of an hour. The absolute necessity of obtaining the active principle of jaborandi was recognized from its first introduction. Mr. Gerrard has removed the chief difficulty in the way of a physiological or clinical investigation of its properties, the alkaloid being clearly capable of producing in a very much smaller dose the full effects obtained by the use of the plant itself. Its free solubility in water is for therapeutic purposes a matter for congratulation. The antagonism to atropine is a property of especial importance, and would seem likely to be productive of the most valuable results.

The PRESIDENT remarked that Mr. Gerrard was the real discoverer of this alkaloid, and the means for the research had been furnished to him by grants from the Conference. He hoped others would imitate Mr. Gerrard's example, and not be slow to ask for grants if they had matter worthy of research. It was singular that jaborandi should have been used in Brazil for so many years and yet have been introduced into this country so lately; but doubtless it would

come into general use. It was stated that the salivation of a dog was arrested by an injection of atropine; it would be interesting to know whether it would also arrest perspiration. It was known that dogs perspire only through the mouth, and not through the skin at all, but he fancied that fact had been overlooked.

Mr. MACKAY said there could be but one opinion as to the value of the paper by Mr. Gerrard. He would, however, like to ask Mr. Gerrard a question. Quite lately there had appeared in some of the price lists the name of jaborandi wood, and the discrepancy between the price of the wood and the price of the leaves and stems was considerable. Had Mr. Gerrard examined the wood, and if so did he find the alkaloid present, and to what extent? The relative prices of the wood, and of the leaves and stems, were five shillings and twelve shillings a pound.

Mr. GERRARD stated that he had used two pounds of the bark removed from the stem. He had tried no experiments with the wood itself. The bark yielded rather less alkaloid than the leaves. The bark was not imported as bark, the plant being imported entire. Specimens had been brought to this country which consisted largely of leaves; the last bales he had seen consisted almost entirely of leaves. He was not aware whether any experiments had been made with the wood. He himself had had no time to work upon it; but was inclined to think the wood did not contain any alkaloid.

Professor ATTFIELD said he had an impression that the wood had been experimented upon by some one, and found to be of inferior value.

Mr. MARTINDALE said he rather thought the wood might be of service. He had some under examination. He had also repeated some of Mr. Gerrard's experiments, and had obtained some alkaloid and also the nitrate, but he had not got any so pure as Mr. Gerrard had. He agreed it was probable that there was more than one alkaloid present. Some six months ago he had published the effects of the drug on himself. A dram dose of it had induced approximated vision, and also an excessive perspiration and salivation. The first portion of the time he was under its influence there was an apparent dilation of the pupil of the eye. He was informed there was an apparent inconsistency in the statement that dilation of the pupil and approximated vision were produced at the same time, but undoubtedly it produced contraction of the pupil after about ten minutes' use when applied locally. Jaborandi was opposed to atropine in its action in this respect, and also in the approximation

of vision. He (Mr. Martindale) had worked at the leaf and the bark, and Mr. Gerrard had worked at them for the reason that they both promised a more abundant yield of the active principle than the wood, which had but little taste, and was almost void of the bitterness and acidity so evident in the bark and the leaf. As, however, the alkaloid obtained possessed none of that acidity, he was led to believe the acrid taste did not belong to the substance which causes the diaphoretic and salivating action. He agreed with what had been stated as to the alkaloid being volatilized in vapour of ammonia. He had failed to get anything more than empyreumatic oil by distilling the purified alcoholic extract with milk of lime, one of the processes described by M. Byasson for its preparation. The alkaloid obtained produced in the half-grain dose all the physiological effects of a dram dose of the leaf. He thought there was a probability of more than one alkaloid being present, though pilocarpine possessed most of the action. The salts of pilocarpine produced a much greater salivating and sudorific action, as well as vomiting, when injected hypodermically than when administered by the mouth.

Mr. BRADY said that he had had some correspondence with physiologists at Cambridge respecting jaborandi and pilocarpine. Mr. Gerrard had been good enough to supply him with specimens of pilocarpine and pilocarpine nitrate for their use, and he had heard from Mr. Langley, of St. John's College, something of the effects of pilocarpine. He should not have mentioned this, because the experiments were not concluded, had not Mr. Martindale mentioned the dilation of the pupil as a symptom, a result which agreed with Mr. Langley's, who seemed to regard the action of pilocarpine as in many respects analogous to that of atropine.

Mr. MARTINDALE said he had that morning tried an experiment upon himself with respect to this point, and he thought that if his eyes were examined then it would be found that they were still under the influence. He had put a little solution of the nitrate into the right eye. There was at first a slight dilation, but in ten minutes there was evident contraction and approximated vision. He could not even then see gentlemen comparatively near to him with the right eye. It seemed that in almost every respect pilocarpine was antagonistic to atropine. One caused perspiration, the other would check it. In a case of poisoning by atropine also, it was possible to check the effects by administering pilocarpine.

Mr. BRADY said he thought Mr. Langley's idea was that there were two distinct active principles.

Mr. UMNEY said he could corroborate what had been said about the contraction of the pupil. He examined Mr. Martindale's eye that morning, and found that the pupil of the right eye was contracted to at least one third the size of the other. Mr. Gerrard's idea of the essential oil found floating on the surface of the water being a stearoptene was, he thought, in all probability correct. Eight or nine years ago he had made some experiments with buchu (a plant of the same natural order), and noticed a large quantity of crystalline matter separating from the essential oil after the distillation with water; being in all probability an analogous result.

Mr. GREENISH asked what would be considered the best pharmaceutical preparation of jaborandi.

Mr. GERRARD said that, considering the active principle of the plant was soluble in water, he was inclined to think a liquid extract would be the best form of preparation. The active principle was extracted by rectified spirit, by proof spirit, and by water; but there was no occasion to use rectified spirit if water would suffice. He thought a liquid extract of similar strength to the liquid extract of ergot (one in one) would be the best form of preparation.

Professor ATTFIELD said he presumed that at present the chemistry and physiology of the matter must be accepted with some little hesitation, as it was not by any means certain that a pure principle had yet been obtained.

Mr. GERRARD said he had endeavoured to purify the pilocarpine on several occasions. He had passed it two or three times through animal charcoal, and he had found that the more he purified his charcoal the less he purified his alkaloid. He had thought the charcoal might be contaminated with phosphates, but though these could be got rid of by precipitation, it did not yield any. For these reasons he was sorry to say he had not been able to place in Professor Attfield's hands a sufficient quantity of the pure alkaloid for chemical examination.

Mr. KINGZETT asked Mr. Gerrard whether he had tried Sonnenschein's method with phosphomolybdic acid.

Mr. GERRARD said some phosphomolybdic acid he had obtained gave no precipitate with the alkaloid; but whether the phosphomolybdic acid was reliable or not he was unable to say.

Mr. WILLIAMS said he was much interested in the process of producing this alkaloid; it reminded him much of the alkaloid eserine of the Calabar bean. The Calabar bean also had a contrary action to the belladonna, and produced contraction of the pupil. It was interesting to find the alkaloid from this plant and the Calabar bean

seeming to run so parallel and to be so similar in many of their characters. He would mention a few facts respecting the bean alkaloid which might throw some light on the reason why Mr. Gerrard did not get his alkaloid pure and white. In making eserine it was found essential that ammonia should not be used in the preparation of the alkaloid. It was best precipitated with carbonate of soda, and acetic acid had been found to be a good solvent. The alcoholic extract of the bean should be treated with dilute acetic acid, which preserved it from decomposition better than water. The account given of the treatment with chloroform quite agreed as far as his experience went with eserine. Eserine should not be allowed to come into contact with the air, as it took up oxygen immediately if it were by accident exposed. It might be obtained almost white, and he hoped some day to obtain it in the form of crystals, but had not succeeded hitherto. With regard to the alkaloid from jaborandi, he should like to know whether an experiment had been tried with acetic acid and carbonate of soda; that treatment would probably avoid what had been spoken of, the subsequent colouring and decomposition of the alkaloid. He had no doubt that what was meant by saying it became darker and darker was analogous to the absorption of oxygen by eserine.

Professor ATTFIELD said it was only fair to Mr. Gerrard to say that the chemistry of the matter had been scarcely entered upon. It was proposed to obtain a large amount of material under a Conference grant, and to carry on investigations under more favourable circumstances than hitherto had obtained.

Mr. GERRARD said he could partly answer the questions put. He had used carbonate of potash, and had noticed an evolution of ammonia; and of course the same result would follow the use of carbonate of soda. Whether it was pilocarpine being changed into ammonia compounds he did not know; he scarcely thought it was, because the bark yielded just the same proportion of alkaloid by treatment with carbonate of potash as it did by the use of ammonia. One great drawback to the preparation of this alkaloid as a commercial product was its free solubility, and the quantity of chloroform it was necessary to use. It was so soluble that on shaking with chloroform only a portion was removed. It takes a large quantity of chloroform to remove a small portion of alkaloid. The mother liquor after being used three or four times even then still contained an appreciable amount of alkaloid.

The next paper read was—

ON THE HORSLEY-STODDART METHOD OF ESTIMATING THE FAT OF MILK.

By ALFRED H. ALLEN, F.C.S.,

Professor of Chemistry at Sheffield School of Medicine; Public Analyst for Sheffield and North Derbyshire.

It will be in the recollection of many gentlemen now present, that on the occasion of our London meeting Mr. Stoddart described and exhibited Mr. Horsley's ingenious method of estimating the proportion of fat in milk, and a discussion took place in which I expressed doubts as to the accuracy of the method described by Mr. Stoddart.

Since the last meeting I have thoroughly investigated the process, and beg to lay before you the results of my experiments.

As employed by Messrs. Horsley and Stoddart the process is as follows:—15 c.c., or 250 fluid grains, of milk are placed in a graduated tube about eleven inches long and three quarters of an inch in diameter. An equal bulk of methylated ether is added, a cork or stopper inserted, and the whole shaken vigorously for five minutes. A like measure of methylated spirit is next added, and the whole well shaken for at least five minutes more, when, on setting it to rest, the oily or fatty matter will rise to the surface almost instantly, and can be easily read off, each division which it occupies being equivalent to 4.15 grains of butter fat.

It is evident that the process is of an exceedingly rapid and simple character, and if capable of giving trustworthy results would be extremely useful as a means of estimating the proportion of butter fat contained in any sample of milk, though the well-known fact that the fat is the most variable of all the constituents of milk renders the method fallacious as a means of ascertaining the presence of added water—a capability which Mr. Horsley appears to claim for it.

It is an interesting fact that a method almost identical with the above was described by M. Marchand as long ago as 1854, in a paper contributed to the *Journal de Pharmacie et de Chimie*, entitled “Nouvelle Méthode de Dosage du Beurre dans le Lait.” Whether Mr. Horsley was aware of the existence of this paper at the time of publication of his process, about two years since (in which no reference whatever is made to any previous experiments), it rests with him to say.

M. Marchand employs a graduated tube of the same length as

that used by Mr. Horsley. He also employs the same proportions of milk, ether, and alcohol as are recommended by Mr. Horsley. To keep the casein in solution, M. Marchand adds to the original milk a single drop of potash solution, and to ensure the rising of the whole of the fat, he places the tube in a vertical position, and warms it in a water bath to about 40° C. (blood heat), until the oleaginous layer which rises to the surface no longer augments.

Mr. Horsley makes no mention of the addition of potash solution, but specially states that no heating or waiting is necessary. With this exception, his process is identical with that of M. Marchand. M. Marchand says that the proportion of fat obtained by his process should be from 3.05 to 3.64 grams per 100 c.c. of milk, which is equal to from 2.96 to 3.54 of fat from 100 parts by weight of milk.

In considering the nature of the process, it at once appeared highly improbable that the oleaginous layer obtained would have a constant composition, being, as it is, a mere solution of ether and alcohol in butter fat, and therefore likely to vary in composition with the temperature at which the experiment is conducted, the proportion of fat present, etc.

As far as can be gathered, either from Mr. Horsley's pamphlet or Mr. Stoddart's paper, no attempt is made to read to a greater degree of accuracy than one quarter of a division; in fact, the deficient and eccentric graduation of the tube renders any closer reading impossible; as one quarter of a division, according to Messrs. Horsley and Stoddart, corresponds to 1.04 grain of butter fat, and they work on 250 fluid grains of milk, it is evident that the apparatus is incompetent to estimate fat more nearly than .415 per cent., a percentage of error quite inadmissible in any but the very roughest analyses.*

The impossibility of really accurately measuring the oily layer with the tube employed by Messrs. Horsley and Stoddart, appears to have prevented them from detecting the variations in the measure of the fat as compared with its weight when separated from its dissolved ether; and has led to some very positive statements on the part of their disciples respecting the constant ratio of the measure to the weight.

For the purpose of ascertaining whether the ratio of the volume

* When the percentage of fat is small, as in partially skimmed milk, any measurement of the volume of the layer is out of the question, as the oil does not form a layer but assumes a more or less globular form. I referred to this fact last year, though my remarks were somewhat misconstrued. (*Pharm. Journ.*, September 12, 1874, 208.)

of the oily layer to the weight of its contained fat was constant or nearly so, I instituted a series of experiments. A miniature pipette was made by drawing out a piece of quill tubing, a mark being made on the neck with a file. A piece of indiarubber tubing was attached to the upper end, for convenience in sucking up the oil into the tube.

I placed in each of four tubes 15 c.c. of the same sample of milk, added 15 c.c. of methylated ether to each, corked each tightly, surrounded the whole with an indiarubber band, and shook the tubes simultaneously for fully five minutes; 15 c.c. of methylated spirit were then added to each, and the shaking repeated for at least five minutes more. The tubes were then placed vertically, the corks removed, and the oil allowed about ten minutes to rise. Portions of the layers from each of the tubes were then sucked up into the little pipette as far as the mark, and the equal volumes so obtained were evaporated at a steam heat in very small porcelain crucibles. The following were the weights obtained from equal volumes of the oily layer yielded by four tubes of the same sample of milk shaken side by side:—

·211 gram.

·212 „

·261 „

·204 „

A second series of experiments on the same milk, gave:—

·230 gram.

·231 „

·236 „

·249 „

Another series of experiments conducted in a precisely similar manner, but with a different pipette, gave:—

·161 gram.

·162 „

·148 „

A further series with the same pipette as the last, but with a different sample of milk, gave:—

·200 gram.

·188 „

·186 „

·171 „

These experiments clearly prove that the ratio of the volume to the weight is not constant, and that two experiments made side by side on the same sample, might give very different amounts of fat,

though the error would be scarcely appreciable by the apparatus employed by Messrs. Horsley and Stoddart.

In order to ascertain the actual ratio of the weight of the fat to the volume of the layer, the pipette employed in the two last series of experiments was filled up to the mark with distilled water, which was then carefully weighed. Two experiments agreed in giving a weight of $\cdot 458$ of a gram, so that the capacity of the pipette was $\cdot 458$ c.c. The last two series of experiments show therefore that 10 c.c. of the oily layer would correspond to the following weights of real butter fat.

$\cdot 161$	gram	corresponds	to	$3\cdot 526$	of fat per	10	c.c. of layer.
$\cdot 162$	"	"		$3\cdot 548$	"	"	
$\cdot 148$	"	"		$3\cdot 231$	"	"	
$\cdot 200$	"	"		$4\cdot 356$	"	"	
$\cdot 188$	"	"		$4\cdot 105$	"	"	
$\cdot 186$	"	"		$4\cdot 061$	"	"	
$\cdot 171$	"	"		$3\cdot 733$	"	"	
<hr/>				<hr/>			
Mean	$\cdot 174$			$3\cdot 794$			
<hr/>				<hr/>			

It appears therefore that so far from 10 measures of the oil corresponding to a constant quantity of butter fat, seven experiments gave results varying from $3\cdot 231$ to $4\cdot 105$. Therefore, even supposing that the apparatus employed by Messrs. Horsley and Stoddart admitted of accurately measuring the volume of the layer (which it does not), the percentage weight of fat deduced from it would be untrustworthy.

The capacity of Mr. Horsley's tube when filled to the zero point is 820 fluid grains, and as each division is said to be 1 per cent. of the whole, the capacity of each "line" or division is $8\cdot 2$ fluid grains. This quantity of oily layer is said by Messrs. Horsley and Stoddart to correspond to $4\cdot 15$ of real butter fat. If this is the case, 10 fluid grains would yield $5\cdot 061$ grains weight of real butter fat.

So far from this proportion being constant, it appears from my experiments that the real yield of butter fat varied in seven experiments from $3\cdot 23$ to $4\cdot 10$, the average being $3\cdot 79$, against $5\cdot 06$ as stated by Messrs. Horsley and Stoddart. The result of the substitution of one number for the other would be that the same milk would yield $2\cdot 49$ per cent. of butter fat against $3\cdot 32$ per cent.

I have already shown that the ratio of the volume of the layer to the weight of the fat varies considerably, even when the experiments are made side by side, and it is only to be expected that

these variations will be still more marked when the time of the year, the quality of the milk, and the general circumstances are all different. It is therefore by no means surprising that Mr. Horsley should have fixed on a number so different from those obtained by me, but the variation conclusively proves how liable to error the process is when applied volumetrically.

At our last meeting Mr. Stoddart showed us a sample of milk taken from his breakfast table at a London hotel, and as he obtained four "lines" of butter fat from it, he contended that it must contain the extraordinary amount of 6.64 per cent. of butter fat. He also made the following suggestive remark: "There is such a tremendous difference of result between the London chemists' and Mr. Ekin's and my own examinations, that we cannot explain it at all."

I beg leave to suggest that the "tremendous difference" observed is due to the employment by Mr. Stoddart of an untrustworthy process added to an erroneous estimate of the value of each "line" of oily layer.

An independent proof that the value of each "line" has been seriously over-estimated is to be met with in the fact that Mr. Stoddart obtained $11\frac{3}{4}$ "lines" from 50 grains of a genuine sample of ordinary butter.* As he himself stated, the above measure of oily layer corresponded to $11\frac{3}{4} \times 4.15 \times 2 = 97.52$ per cent. of butter fat in the sample of butter, assuming the process to be reliable. This leaves barely $2\frac{1}{2}$ per cent. for water, salt, and curd together, though the sum of these three constituents averages 15 per cent. ! Except in cases in which the butter has been purposely fused, I believe I may say that such percentage of real fat in butter is absolutely without a parallel.

It is evident, therefore, that the measurement of the oily layer, even when accurately performed, is only capable of giving results of the roughest possible kind, and that any estimation worth making by a chemist must be obtained by drawing off the whole of the oily layer (adding a little ether to dissolve the last portions), and gently heating it till it ceases to lose weight.

An additional source of error is to be found in the fact that the few minutes allowed by Messrs. Horsley and Stoddart for the rising of the oily layer are frequently quite insufficient for the purpose. On further standing, a considerable additional layer is sometimes obtained. This fact appears to have been fully recognized by M. Marchand, but the hasty manner in which the experiment is per-

* *Pharm. Journ.*, September 5, 1874, p. 189.

formed by Messrs. Horsley and Stoddart renders the results obtained by them of very inferior value.

M. Marchand also takes the precaution of warming the tube to ensure the complete rising of the fat. The cork must be firmly replaced before the tube is warmed, or some of the liquid may be projected if the temperature of 40° C. be much exceeded. This is really essential, a sensible quantity of fat rising on heating, even though many hours have previously elapsed.

The extra amount so obtained is very variable, so that no constant correction or allowance can be made for it. In four experiments made simultaneously I obtained on heating:—

1.	·0180	gram	=·12	per 100	by volume of milk.
2.	·0165	"	=·11	"	"
3.	·0305	"	=·20	"	"
4.	·0180	"	=·12	"	"

The same four quantities treated in the ordinary way (but allowing some hours for the rising of the layer, and weighing the fat obtained on evaporating off the ether) had previously given quantities of fat which, when added to the above supplementary weights obtained on heating, showed the following total percentages of fat:—

1.	3·18	of butter fat	per 100	by volume of milk.
2.	3·14	"	"	"
3.	3·27	"	"	"
4.	3·17	"	"	"
<hr/>				
Mean	3·19	"	"	"

According to M. Salleron, there is a loss in the process owing to a portion of the fat remaining in permanent solution. The existence of this source of error seemed extremely probable. With the view of ascertaining the extent to which it was likely to affect the accuracy of the process, two portions of the above sample of milk were evaporated to dryness, the fat extracted with benzoline, and recovered by evaporating the solution. The following results were obtained:—

1.	3·38	per 100	by volume of milk.
2.	3·30	"	"
<hr/>			
Mean	3·34		

Thus this method, which may be regarded as giving the true percentage of fat present, and which certainly cannot give too high

a result, yielded figures which were on an average '15 higher than were obtained by Marchand's process. The difference is not great, and as one of the experiments by the latter method gave a result only '07 lower than the mean of the above estimations, it may be said that Marchand's process, with sufficient time, careful warming, and weighing of the butter fat, gives fairly accurate results, though somewhat below the truth. The fault is here on the right side, for a low estimation of the fat would tend to make the proportion of "solids not fat" excessive, and therefore to the advantage of the dealer when adulteration of the milk by watering was in question. The natural proportion of fat in milk is so variable that a somewhat low estimation of it could not do any possible harm unless the percentage were so small as to bring it near the lower limit observed in experiments on undoubtedly genuine milks.

M. Marchand recommends the addition of one drop of caustic potash before shaking the milk with ether. The plan is of considerable service, as the alkali dissolves the greater part of the casein (and probably the membranous covering of the fat globules), and thus facilitates the action of the ether and the subsequent rising of the oily layer. It is also useful for correcting any tendency to acidity and premature coagulation of the casein.

My thanks are due to Mr. L. N. Lean, for his assistance in making the series of experiments above recorded. The general conclusions arrived at from the observations and experiments detailed in the above paper are therefore as follow:—

1. The method of estimating fat in milk described by Mr. Horsley is extremely fallacious, the chief sources of error being that,—

(a) The graduation of the tube does not admit of accurate measurement of the oily layer.

(b) When accurately measured the volume of the layer bears no constant ratio to the weight of its contained fat, and the conditions on which the ratio depends are entirely beyond control.

(c) A considerable and very variable loss occurs from imperfect rising of the fat during the short time allowed for the purpose.

2. A method of estimating fat in milk closely resembling that of Mr. Horsley, was described by M. Marchand as long ago as 1854. In this process, loss from imperfect rising of the fat is completely guarded against by warming the tube to about 40° C., and allowing it to stand till no additional fat rises. The addition of a drop of caustic alkali at the commencement of the process is a decided improvement.

3. The method of Marchand is capable of giving results of very considerable accuracy, provided that the layer of oil is not measured, but drawn off and heated till of constant weight. The results so obtained are somewhat below the truth, owing to the slight permanent solubility of the butter fat in the subjacent mixture of alcohol, ether, and water. The loss due to this cause is very small, and is probably constant in amount.

4. The process with the above modifications and precautions is rapid, and requires but little manipulation. It can be advantageously employed instead of Wanklyn's method for the estimation of fat in milk. By subtracting the weight of fat obtained from that of the total solids, the proportion of "solids not fat" can be ascertained at least as accurately as by treating the residue with ether.

The PRESIDENT asked the meeting to record its thanks to Mr. Allen, and observing that he remembered they had an exciting discussion on this subject last year, declined offering an opinion on the vexed question.

Mr. STODDART said he supposed it was his place to reply to Mr. Allen's very positive and not very complimentary paper. First of all, the tube shown was not his tube; his tube was not of so great diameter, and, as he showed last year, he always used a stoppered tube. He was not surprised at Mr. Allen's discrepancy, because last year he could not produce a layer at all. Mr. Allen then got up and said he could not think how it was obtained; that was recorded in the *Year-Book*. Another thing, Mr. Peter Squire manipulated the samples of milk shown last year, and he got results which corresponded with his (Mr. Stoddart's), showing that there could not be any great discrepancy. With regard to there being eccentricities in the results, he totally contradicted that in the most positive manner; and asked any gentleman who saw the array of tubes produced last year whether his position was not proved in the most incontestable manner. Mr. Allen's discrepancy of measurement might have been easily produced in this way. If a tube were used such as that shown, which was closed by the thumb, when the ether was put into it, and shaken up, if great care were not taken a little spirting occurred, and that made a wonderful difference. When the alcohol was added the spirting was four times as much as before, and that was the reason why he discarded a tube stopped by the thumb. With regard to the period of ten minutes, he never said it must be ten minutes exactly; and, in fact, the tubes were frequently left for half an hour. With regard to the addition of

soda, he disagreed with Mr. Allen and M. Marchand in thinking that soda or potash were good additions. He tried them before he heard of Horsley's tube experiments, and he did not find the results as good as Mr. Allen's. The results given by the tubes were really very uniform, provided sufficient care were taken in ascertaining the lines, but if by the slightest inattention any of the fluid or spirituous vapour were allowed to escape, there was a tremendous inaccuracy. Between town and country milk there was a great difference. Somebody said last year that it was impossible he could have got the cream from his breakfast milk. He, therefore, went to the Golden Cross, where he had been staying and found that the milk had been standing, and the top of it had been given to him. As to the allegation that measure and weight were not identical, he would say that, making a reasonable allowance for difference, they were so. He contradicted the paper *in toto*, and was not the only one who did so. He did not, however, use these tubes for analyses. It would not be right to rely upon their indications alone, and he had never given a certificate based upon them. Although they would give accurate results, he only used them as a sort of quick method of ascertaining whether it was necessary to proceed to analysis. It did not answer to use for this particular purpose spirit which was not 60° over proof. He should like to ask Mr. Allen whether the spirit he used had been tested, and whether it was always the same strength. He was surprised at Mr. Allen's positiveness, for Mr. Horsley had made experiments, and Mr. Ekin, of Bath, had made experiments, and they both corroborated his own observations. He really must be excused if he said that Mr. Allen's accusations of inaccuracy and eccentricity were incapable of proof.

Mr. SIEBOLD said he had made a large number of experiments with Horsley's tubes, and could fully corroborate what Mr. Stoddart had just said. It was quite true it was impossible by this process to estimate the butter fat down to a decimal; but on the whole, results were obtained agreeing within a quarter per cent., which was enough for all practical purposes. By this process the butter fat was estimated in a comparatively short time, and if a sample of milk having a sp. gr. of 1.032 yielded more than two lines of fat, all thought of adulteration might be dismissed. The specific gravity alone meant nothing; the butter fat alone meant nothing; the two together meant a great deal. Without going through any tedious process, it was possible in a short time to say with tolerable certainty whether it was needful to go further.

He was in a position to explain the discrepancies noticed by Mr. Allen. He had himself tried several experiments and obtained uniform results. Mr. Stoddart had succeeded well by shaking for five minutes, but there was a difference in different people's shaking, and in his own case five minutes did not suffice; he needed to shake for seven or eight minutes, and to be safe he shook for ten. With five minutes' shaking his results disagreed as much as those of Mr. Allen. One might not shake as violently in one case as in another, and the difference must be made up for by increase of time. He allowed the tube to stand for an hour, and in winter he found it necessary to place the tube in warm water. In summer time half an hour was sufficient to obtain a clear layer of oil, provided the tube had been shaken a sufficiently long time, and spirit of at least 60° over proof used; manipulating in that way, he obtained very good results on evaporating equal bulks (1 c.c. each time) of the oily layer. Some of Mr. Allen's results too agreed very closely. He noticed that Mr. Allen's gave the figures of 111, 121, and 111, and it seemed surprising that from these there should be a jump to 160. The natural conclusion was that there was some fault in the manipulation. With all deference to Mr. Allen's undoubted ability as a food analyst, he believed he had made this mistake. He had stuck too closely to the directions given by Mr. Horsley. When he (Mr. Horsley) spoke of shaking for at least five minutes, it did not follow that one ought to stop directly the five minutes were up. The object to be effected was to get the butter fat as a clear oily layer on the surface, and unless the shaking were done with great force it was necessary to extend the time mentioned by Messrs. Horsley and Stoddart. He could recommend this test as an excellent way of deciding whether a more complete analysis was necessary or might be dispensed with.

Mr. EKIN said that as his name had been mentioned he would say a few words, although he would have rather not taken part in a tournament of public analysts, with whom it was rather early days to enact the tragedy of the Kilkenny cats. He had observed from the *Pharmaceutical Journal*, that this storm in a teacup was going to be reopened, and he thought he would make one or two experiments to see if they would fortify him in the impressions derived from former experiments. As Mr. Stoddart had said, he took it for granted no one would rely upon the tubes except within the limits named. Where a certain number of butter lines were thrown up one might be satisfied the milk was not adulterated. He had taken the milk supplied to his house on the previous Thursday morning, and first

of all he put it into a 1000 grain measure. It threw up 6 per cent. of cream. He tried it by Mr. Horsley's plan and got 1.75 lines of butter fat, which corresponded to 2.9 per cent. He then took the total solids in the ordinary way by evaporation, and found them to be 10.5 per cent. This residue, exhausted by ether, gave a loss of 2.92 per cent. The ether washings were collected in another tared capsule, and on being evaporated, first in a current of warm air, the drying being afterwards completed on a water bath, gave 2.92 per cent. of butter fat. Thus we have—

	Fat per cent.
By Horsley's plan	2.9
One hundred grains of the same milk giving total solids . . . 10.5 grs.	
Solids without fat . . 7.58 „	
Loss	2.92 grs., equal to . . 2.92
The ether washings also yielding on evaporation	2.92

Therefore, so far as that experiment was concerned, it quite proved the accuracy with which the fat may be estimated by the Horsley tube. Indeed, he should have preferred that the figures had not agreed quite so well; as it was they looked suspiciously accurate, but he could simply give them as he found them. This milk was evidently adulterated. He might say in passing that he found Professor Redwood's modification of Mr. Wanklyn's plan, as mentioned by the professor last year, to answer admirably. Mr. Wanklyn recommended that a small quantity of milk should be evaporated in a platinum capsule, but a horny layer was thus produced, from which it was troublesome to extract the butter. Professor Redwood suggested taking a larger quantity, say 100 grains, which, by being constantly stirred during evaporation, gives the residue in a beautiful granular condition, easily exhaustible by ether. Mr. Ekin further said that a gentleman had supplied him with some milk from a splendid Guernsey cow, which threw up 24 per cent. of cream in a 1000 grain measure, and gave 4.5 lines of butter oil, equal by calculation to 7.47 per cent. of fat. He treated it in the same way and got total solids 16.31; solids without fat 8.65, difference 7.66. The fat obtained from the ethereal solution amounted to 7.55. Here, again, it will be seen that the results obtained by the Horsley tube tallied closely with those obtained by other methods. The milk was undoubtedly genuine, but the total solids not fat were 8.65, and that

was unfortunately below the analyst's standard of 9 per cent. He was much afraid that any person selling that milk would be liable to be fined. He thought that experiment disposed of the question about the richness of milk given from Alderney cows. He had noticed before that such milk was not so rich in casein, but he had not himself examined a sample before where the solids not fat were below 9 per cent. As to Mr. Allen, he did not despair of him; he had already made great progress; he had now obtained lines of butter fat, which he confessed last year he could not do; and if he continued his researches until the next meeting, no doubt he would find all difficulties disappear.

Prof. REDWOOD said it had been stated that if the specific gravity of milk were taken, and the amount of fat afterwards determined, from these two data might be decided whether milk was genuine or adulterated. He must say he had come to a different conclusion, since the specific gravity of milk, irrespective of the butter fat, did not give a perfectly reliable datum for calculation. The difference in the proportion of casein, milk sugar, and solids, considerably varied the specific gravity of the liquid. The real specific gravity of the liquid deprived of fat indicated a proportion of solids in one case different from another, and therefore he thought that it would be unwise, as a general rule, to rely upon that mode of arriving at a conclusion; although it might go pretty near, yet it would not, as he believed, be accurate. Another point he would allude to was this: in the examination of milk from a Guernsey cow Mr. Ekin got a smaller proportion of solids not fat than was indicated by the analysts as their standard, although the milk was obviously genuine milk. It did not appear, however, that in that case a sufficient, or indeed any, allowance had been made for the fact that there was an increase in the quantity of butter fat—an unusually large quantity of butter fat—being upwards of 7 per cent.; whereas when we estimate the solids not fat as being at least 9 per cent., we take only 3, or at most $3\frac{1}{2}$ per cent. for butter fat. The quantity of milk operated on was a weighed quantity of 100 grains. If in that 100 grains there should be in one case $7\frac{1}{2}$ or nearly 8 grains of butter fat, and in another case only 3; if from the two samples the solids not fat were estimated, corresponding percentages were not taken; in the one case the quantity of solids not fat was from only 92 or 93 grains, in the other taken the solids not fat were from 97 grains, consequently that would account for the slight discrepancy. The 8.7 which Mr. Ekin got from the 100 grains of milk would have amounted to something like 9 if he had taken a quantity of

the liquid devoid of fat that would be equal to what he would take in another case.

Mr. EKIN said that what Prof. Redwood had pointed out was self-evident, and he was glad it had been pointed out, because public analysts, judging from their reports, simply took the percentage as he had stated it, and, of course, if in 100 grains of milk they find the total solids without fat below 9 grains, it might happen that the milk would be condemned on that account. He was puzzled to know how it was that in London the analysts could speak so positively to such proportions as 7 and $7\frac{1}{2}$ per cent. of water being added. He could understand their saying that at least so much had been added; but he could not understand their relying to the extent they did on an arbitrary standard that had no existence in nature.

The PRESIDENT said to discuss that point would be going too far away from the subject.

Mr. SIEBOLD said that what he had remarked about specific gravity had been misunderstood. He did not wish to imply that the determination of the specific gravity and of the amount of the fat was in all cases sufficient; by no means. But he stated that in many cases it would save the trouble of further analysis. Whenever the specific gravity was not under 1.032, and more than two lines of butter fat were obtained, one might be certain that no addition of water had been made. It was quite certain that the variations of specific gravity, corresponding with the quantities of milk sugar and casein, were not so great as to upset the result. If the specific gravity was below 1.030, and the butter fat was $1\frac{1}{2}$ line, the milk might be adulterated, and in such a case a more complete quantitative analysis would be necessary.

Mr. ALLEN said he wished to disclaim being actuated by any such feeling as that attributed to him of wishing to raise a tempest in a teacup, or in any way to quarrel with his brother analysts. But when a process was brought forward, and a positive statement made as to its value, it behoved every man to test carefully whether it were accurate or not. If he did not find it so he was not to blame if he at once published the fact before that same assembly which heard the original description. When a man was fortified by experiments the more positive he was the better. Mr. Allen claimed that the gentlemen who had spoken substantially agreed with him. When a person desired to test the accuracy and value of a process, he ought to adhere as rigidly as possible to the conditions laid down by the inventor, otherwise the inventor was entitled to say "You

have not done what I directed you to do." He himself had tested the process as it was described, he had nothing to do with improvements since adopted privately. The tube shown in the wood-cut attached to Mr. Stoddart's paper last year was an exact facsimile of that invented by Mr. Horsley, and shown that day. Last year Mr. Stoddart directed the measurement of the sample of milk and the use of methylated spirit, but he now said he weighed 250 grains of the sample and employed pure and absolute alcohol. In his paper last year, and in Mr. Horsley's original pamphlet, a few minutes only were allowed for the rising of the fat, but Mr. Stoddart now allowed a considerable time, as recommended by Marchand. Mr. Siebold went further, and admitted the desirability of warming the tube in winter, and in summer, of course, the temperature was already nearly that recommended by Marchand. The fact that Mr. Stoddart and Mr. Siebold had independently found these modifications and precautions desirable was the strongest evidence of the fallacious character of Mr. Horsley's original process. What he said a year ago about not obtaining layers of fat, corresponded to what had just been said during the discussion that very morning about the butter when the milk was poor forming globules. In that circumstance there was an indication that the process was only capable of being used when the amount of fat exceeded a certain proportion, and that was the reason why he could not obtain a measurable layer with certain adulterated samples of milk. There was nothing wonderful in that, and under the same circumstances any one else would obtain a similar result. (Mr. STODDART: I use a narrow tube.) Accuracy of measure would depend upon the accuracy of the tube; the narrower the tube is, the more finely divided, the more exact one could be, and with his pipette he could measure to the hundredth part of a grain. No doubt if he had been content with Mr. Horsley's measure, he should not have discovered the variation between the weight of the fat and the volume of the oily layer. He had followed the directions of Messrs. Horsley and Stoddart as to time, and they said that the whole process need not occupy more than a quarter of an hour. He had shaken religiously for five minutes, and for another five minutes, after adding alcohol. It appeared that Mr. Stoddart had been misunderstood, for he now said he should not think of using this except as a rough process, and that was all he (Mr. Allen) contended for. All he would say was that the process was a fallacious one if used alone, but if it was only used as an indicative process, it was only necessary to affirm that it was not scientifically correct.

The Conference then adjourned for luncheon.

Upon the Conference re-assembling after luncheon:—

Mr. HORSLEY made a few remarks, in the course of which he said he did not know why Mr. Allen should have called the process the Horsley-Stoddart process. It was no process of Mr. Stoddart at all; he had merely taken it up as a friend. Mr. Horsley further contended that there were essential differences between his process and that of M. Marchand, and that it was unfair to insinuate piracy by speaking of their close resemblance.

The next paper read was on—

CALCIS PHOSPHAS, B.P.

By J. F. BROWN.

This paper records a very imperfect attempt to throw light upon the actual composition of this salt, its purity as commonly met with, and its capabilities of entering into a definite and permanent state of solution..

It was suggested to me in the course of some researches upon Parrish's Syrup of the Phosphates, the results of which I hope some day to publish.

The first point to which I would direct attention is that it commonly contains a considerable amount of water.

No mention of this is made in the Pharmacopœia, nor in any authority to which I have referred.

In the following table the loss of weight by ignition is noted respecting eight samples, for three of which I am indebted to the kindness of Mr. A. Redford, of Liverpool:—

A	24 per cent.	E	13·1 per cent.
B	15·5 „	F	17·25 „
C	17·5 „	G	14 „
D	18·75 „	H	12 „

Of these, A lost between 13 and 14 per cent. when dried in an air bath at a temperature below 100° F., and did not further lose weight when heated on a sand bath to 300° F.

F became light fawn coloured after ignition.

H was prepared by myself, following strictly the directions of the Pharmacopœia; 200 grains of bone ash left 18 grains of

insoluble residue, and the yield of washed precipitate, dried in a water bath until it ceased to lose weight, was 162 grains.

This point was not reached until after fifteen hours' exposure, and ten hours later the weight had increased to 168 grains by absorption of moisture from the atmosphere.

Ten grains taken from the latter quantity left 8.8 grains residue after five minutes' ignition over a Bunsen burner, corresponding to 147.84 grains for the entire quantity.

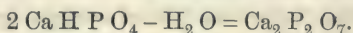
This experiment being repeated, 148 grains only were left, but after eighteen hours a further increase in weight of 4 grains was observed.

A week after (on June 7) the weight was unchanged, the air having been warm and unusually dry. During a cold and damp season a much greater absorption would no doubt have taken place; but the experiment may be sufficient to illustrate the hygroscopic character of calcium phosphate, and the tenacity with which it retains moisture.

The formula given in the Pharmacopœia for phosphate of calcium is $\text{Ca}_3\text{P}_2\text{O}_8$, and Dr. Attfield's "Chemistry" (p. 81) represents the tricalcic phosphate of bone ash as unaltered in composition by the process officially directed for its purification.

On the other hand, Fownes' "Manual" (10th ed., p. 371) states that the phosphate having the formula $\text{Ca}_3\text{P}_2\text{O}_8$ is, by solution in acid and reprecipitation with ammonia, converted into CaHPO_4 .

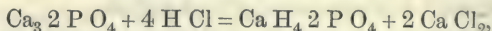
If the latter statement be correct, I need hardly remind you that the residues left after ignition would consist of calcium pyrophosphate, $\text{Ca}_2\text{P}_2\text{O}_7$, formed by the abstraction of a molecule of water from two molecules of calcium phosphate, thus,—



The bone ash from which I prepared my own specimen lost 2 per cent. of its weight on being ignited; and, taking as a guide Berzelius' analysis of ox-bones, published in Fownes, p. 975, it may be assumed that it contained 84 per cent. of tricalcic phosphate.

Since 9 per cent. remained insoluble, the theoretical yield would be 150.5 grains; the actual amount, as before stated, being nearly 148 grains.

The quantity of hydrochloric acid ordered to be used falls short by 54 grains (of HCl gas) that required according to the equation—



so that a slight deficiency is here accounted for.

This, as well as the other seven samples, were tested volumetrically for the phosphoric radical by means of a solution of nitrate of lead, titrated with pure phosphate of sodium, so that each grain measure represented $\cdot 005$ grain P_2O_5 .

The lead solution was used in known excess, and then a solution of potassium bichromate, corresponding to it in strength, was dropped in until a drop of the clear supernatant liquid gave a red tint with a drop of solution of silver nitrate, indicating free bichromate.

The difference in the readings of the two burettes gives, on multiplying by $\cdot 005$, the quantity of P_2O_5 present in the sample tested.

I may remark in passing that the solution remains turbid as long as it contains lead, but the moment the whole of that metal is thrown out of solution, a clear stratum of fluid is left by the sinking precipitate.

The samples of phosphate were dissolved, one grain in a fluid dram of distilled water, by the aid of one minim of B.P. nitric acid; and to this quantity forty minims of solution of acetate of sodium, B.P., were added as the first step in the process, which so far covers the same ground as the Pharmacopœia tests.

It should therefore be noted that D and H were the only samples which remained clear on the addition of the sodium acetate solution; of the others, E was the most turbid, C, G, F and A stood in this respect in the order written.

The acid solutions of G, C, F and E stood for some days before testing, and deposited in the order in which they stand; E being almost clear.

The following table gives the results obtained:—

A	41.75	per cent.	E	34.5	per cent.
B	42.969	„	F	30.0	„
C	35.5	„	G	31.5	„
D	41.85	„	H	43.25	„

The sample A was carefully tested also with solutions of uranic nitrate and ferric chloride, using, as suggested by Mr. Stoddart, sulphocyanide of potassium as an indicator with the latter.

By each method the same result was arrived at.

Boiling the solution before or after mixing, and adding the solution of sodium acetate after instead of before the volumetric lead solution, were expedients resorted to without varying, or only to a trifling degree, the constancy of the results.

Now, if the 76 per cent. of residue left by A consisted of $\text{Ca}_3\text{P}_2\text{O}_8$, the original weight should contain $76 \times 142 \div 310 = 34.8$ per cent. P_2O_5 .

But if the residue be calcium pyrophosphate, $\text{Ca}_2\text{P}_2\text{O}_7$, it should contain—

$$76 \times 142 \div 254 = 42.48 \text{ per cent.}$$

of the phosphoric radical.

Again, H, which lost 12 per cent., should, by the former calculation, yield $88 \times 142 \div 310 = 40.3$ per cent., by the latter, $88 \times 142 \div 254 = 49.2$.

Sample D works out 37.2 and 45.4 per cent. respectively, and these two give volumetric results which seem to bear no relation to those calculated upon either theory.

I very much regret that the pressing calls of business have prevented my applying to each sample the uranic and ferric volumetric tests.

The lead process is recommended by good authorities, and the only defect in it of which I am aware is that the solution is slightly precipitated by the sodium acetate, so that the results appear a little too high.

Probably it answers perfectly for determining the value in soluble phosphates of manures, etc., but fails when the object is to get at the actual quantity of the radical present in a compound which, like calcium phosphate, is more or less soluble according to the temperature to which it has been exposed.

I have found that the residues after ignition, when dissolved with excess of acid, are perfectly intractable to this method.

My next point is, that although Fownes states that the two calcium phosphates ($\text{Ca}_3\text{P}_2\text{O}_8$ and CaHPO_4) are obtained by adding the respective sodium compounds to calcium chloride, I found that using in atomic proportions the chloride and ordinary sodium phosphate, both solutions being perfectly neutral to test paper, a strong acid reaction was developed on mixing them; and that the weight of the precipitate, after it had been well washed, dried, and heated to redness, corresponded to the proportions expressed in the equation—



The calcium chloride employed was assayed by the volumetric process with solution of silver nitrate, and a correction made for the moisture it contained.

In applying the volumetric test to the product, the difficulty I

have before stated was evaded by taking the weights already proved to produce a certain weight of precipitate, collecting it with great care, washing and dissolving it while moist in nitric acid largely diluted with water.

So prepared, a solution containing 4.6 grains of tricalcic phosphate yielded 2.1025 grains P_2O_5 , the theoretical amount being 2.107 grains.

Apparently, there was a slight loss of precipitate, although I took the precaution of neutralizing with ammonia after mixing the solutions.

The solution of this phosphate precipitated largely on the addition of sodium acetate, and the addition of glacial acetic acid was necessary in order to hold it in solution.

Glancing over my notes I find that I have omitted to mention that sample A, on being dissolved, re-precipitated with ammonia and treated with glacial acetic acid (diluted to eight or ten times its volume with water) gave a solution which at first was clear, but on standing for a night deposited strings of beautiful feathery stellate crystals, like snow, which refused to redissolve on adding more acid and warming.

The quantitative test of the Pharmacopœia applied to this sample gave as a result 8.2 grains, which is not surprising when you remember that it lost 14 per cent. when simply dried in the air bath.

In conclusion, I venture to suggest that the official standard of purity should be improved by fixing the percentage of moisture permitted to be present; and that the temperature at which the precipitate ought to be dried should be definitely stated, and of course made to correspond with this.

The PRESIDENT said he was afraid Mr. Brown had taken up a difficult subject. He believed chemists were by no means agreed as to the true composition of the salt derived from bone ash. The precipitates obtained by precipitating calcic salts by means of phosphate of soda were pretty definite, and Warrington had made them out well; but the composition of bone ash still remained a moot point which was not by any means cleared up. He himself had made experiments in years past by analyzing similar bones of animals of different ages. They differed according to their age; the lime constituent of the phosphate increased as the age increased. As this phosphate was derived from bone ash, it must vary in composition according to the nature of the bones from which it was made.

Professor ATTFIELD said that as he gathered that Mr. Brown would probably continue his examination of this phosphate of calcium, it would be as well to remind him of original researches made by others. He had referred to his predecessor, Mr. Fownes, and himself; but really with Wotton each might say, "I am but the gatherer and disposer of other men's stuff." If he would refer to the researches of Raewsky, Price, Bödeker, and Warrington, he would find that a great deal had been done in the direction in which he was working, while there was ample room for continued research. He had scarcely taken into full account the effect that temperature had on the composition of these precipitates. By precipitating in the cold with ordinary phosphate of sodium and chloride of calcium, a precipitate was obtained which contained hydrogen, CaHPO_4 . If this were boiled with the supernatant liquid, cooled, and when cold washed, and then dried over the water bath, its composition was considerably altered, and it was partially if not wholly converted into phosphate of calcium, having the formula $\text{Ca}_3\text{P}_2\text{O}_8$. Bone ash contained also a large quantity of phosphate of magnesium—5 to 10 per cent., and in some cases more.

Mr. ATKINS said it had been remarked that the phosphate of lime in bones varied according to their age. There was more gelatine in the bones of the young, and more phosphate of lime in the bones of the old; hence we could stand many a tumble while we were young, which would produce a broken bone in advanced life. The previous discussion seemed to indicate a scarcity in the milk of human kind-ness. It would be well if gentlemen would give up dogmatic assertions on points which may have to be decided by magistrates. The disposition of fat, casein, and other matters might, he thought, vary according to the times of the year and the kinds of food on which animals were fed, just as bones, if critically examined, might be found to vary in the proportion of phosphate of lime with the colour of the owner's hair.

A paper was then read on—

JAPANESE PEPPERMINT CAMPHOR.

By G. H. BECKETT AND C. R. ALDER WRIGHT, D.Sc.,

Lecturer on Chemistry in St. Mary's Hospital Medical School.

Through the kindness of Mr. John Moss (Messrs. Corbyn & Co.), we have received a liberal supply of well crystallized Japanese peppermint camphor, and also of the liquid camphor oil simul-

taneously imported, the crystals being, in fact, the stearoptene of the oil, separated from the liquid constituents by standing and pressure. This crystalline camphor has been already examined by Oppenheim (*Chem. Soc. Journ.*, 1st series, xv., 24), who found that it contains more hydrogen than ordinary camphor, being indicated by the formula $C_{10}H_{20}O$ —ordinary camphor being $C_{10}H_{16}O$ —and that it is a kind of monatomic alcohol, *menthylic alcohol*, forming a hydrocarbon, *menthene*, $C_{10}H_{18}$, by the action of dehydrating agents just as ordinary alcohol gives rise to ethylene.

This alcohol, being homologous with allylic alcohol, is manifestly more closely connected with the "fatty" or methylic alcohol series than with benzene derivatives; whilst the hydrocarbon menthene is just midway between the 10-carbon marsh gas homologue and cymene, thus:—

Decane.	.	.	.	.	.	.	$C_{10}H_{22}$
Decylene	.	.	.	.	.	.	$C_{10}H_{20}$
Menthene	.	.	.	.	.	.	$C_{10}H_{18}$
Terpenes	.	.	.	.	.	.	$C_{10}H_{16}$
Cymene	.	.	.	.	.	.	$C_{10}H_{14}$

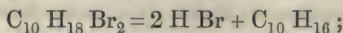
It is, therefore, of some interest to see whether cymene is obtainable from menthene, and hence from menthylic alcohol, by simple treatment,—i.e., whether these substances are not connecting links between the fatty and aromatic series.

Oppenheim found the melting point of menthylic alcohol to be 36° ; the crystals sent to us were found by Mr. Moss to melt at 39° , re-solidifying at 37.5° ; on dissolving them in hot dilute alcohol no crystals deposited on cooling, but an oily fluid separated; this gradually became crystalline as the traces of alcohol retained by it evaporated, and after exposure to air for several weeks, was found to melt at 42° , and to boil at 212° (corrected, Oppenheim found 210° and Mr. Moss 215°): on analysis numbers were obtained agreeing sharply with the formula $C_{10}H_{20}O$.

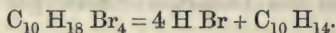
The crystals were heated with about their own weight of zinc chloride, the distillate (separated from the aqueous portion) being then poured back and cohobated with the zinc chloride for some hours; but little resin was thus formed, almost the whole being transformed into menthene boiling at 164.5 to 165.5° (corrected) after cohobation with sodium (Oppenheim gives 163° as the B.P. of menthene); on analysis numbers were obtained agreeing well with the formula $C_{10}H_{18}$.

Oppenheim has already shown that by the addition of *two* equi-

valents of bromine to menthene a dibromide is formed which readily splits up into a terpene and hydrobromic acid, thus—



and hence has established a connection between the terpene series of hydrocarbons and derivatives of ethylene homologues such as $\text{C}_{10} \text{H}_{18} \text{Br}_2$ (derived from $\text{C}_{10} \text{H}_{20}$ by substitution of H_2 by Br_2); since terpenes have been shown to be cymene derivatives, it seems probable that menthene is really connected with cymene; that this is so we have found to be the case by combining *four* equivalents of bromine with menthene, and heating the resulting oily tetrabromide of menthene, or *tetrabromodecane*, when it breaks up into cymene and hydrobromic acid, thus—



Hence it is manifest that menthene is strictly intermediate between the paraffin and the benzene homologous hydrocarbons, as it is between the ethylene series and the terpenes; and that it is possible to pass from the paraffin series to the benzene series *by one single simple reaction*.

The cymene thus obtained from menthene was found to be identical with ordinary cymene obtainable from camphor terpene, and various constituents of essential oils, as described in the *Year-Book*, 1863, 518, 519; 1864, 631.

The liquid Japanese camphor oil, received from Mr. Moss, appeared to be a solution of the solid camphor, $\text{C}_{10} \text{H}_{20} \text{O}$, in a permanently fluid substance containing less hydrogen, probably indicated by the formula $\text{C}_{10} \text{H}_{18} \text{O}$, and isomeric or identical with the substance of that composition contained in citronella oil. On fractional distillation, a little came over below 205° ; the principal portion, however, distilled between 210° and 215° , and gave on analysis, numbers agreeing with a mixture of $\text{C}_{10} \text{H}_{20} \text{O}$ and $\text{C}_{10} \text{H}_{18} \text{O}$; a little came over at higher temperature still, whilst a small portion was not volatile even at 300° .

On heating the distillate at 210° – 215° with zinc chloride, menthene was obtained boiling at 165° , together with resinoid substances derived from the $\text{C}_{10} \text{H}_{18} \text{O}$ constituent by polymerization and partial removal of the elements of water. It was not found practicable to cause the separation of crystals of camphor from the liquid oil by cooling in a freezing mixture, even when a crystal of the solid was dropped in, and the whole kept at a low temperature for several hours; it does not therefore follow, however, that the $\text{C}_{10} \text{H}_{20} \text{O}$ constituent present in the liquid oil is not the solid camphor melting

(when pure) at 42° , as a minute quantity of some permanent liquid, *e.g.*, alcohol, wholly prevents the solid camphor from crystallizing when once liquefied; it is, however, by no means impossible that the liquid oil contains an isomeric modification liquid at the ordinary temperature.

The PRESIDENT said this paper might conveniently have followed Mr. Kingzett's. It was a contribution to the same class of researches; and if Mr. Kingzett continued his researches he might possibly make use of it. It was a contribution to a very large question which was by no means exhausted, and on which Dr. Wright had contributed papers before. For this he would, in the name of the Conference, tender him hearty thanks.

The next paper read was on—

THE USE OF OPTICAL ANALYSIS IN PHARMACY.

BY HENRY POCKLINGTON.

I will, with your permission, look upon my subject as an answer to the following question—In what direction is optical analysis likely to be useful in pharmacy?—and will divide my answer into three divisions, corresponding to three methods of optical analysis, microscopical, polariscopical, and spectroscopical. And I will for the present regard pharmacy as the art of selling drugs, including of course their purchase, and to a limited extent their preparation, but excluding all that belongs to therapeutics or to medical diagnosis, thus closing myself from those many fields in which the cultured pharmacist employs himself outside the pure business of his calling.

On the use of microscopical analysis to pharmacists I have written so much—unfortunately not so well—that I can hardly hope to say more here than by way of summary of what I have said elsewhere. The most evident field in which the microscope may be of service is in detecting adulterations of such drugs as are purchased in a powdered condition, and it may safely be said that no pharmacist who has proper regard for his safety can afford to neglect its use, personally or vicariously. At the same time it must not be understood that I mean to state that adulteration of such substances is extensively rampant. The exact contrary is, I think, the case so far as concerns high-class houses; but I presume business men will not care to give any house, or houses, of however high class, a

monopoly of dealing, and will prefer to hold themselves open to deal with newer men towards whose dealings they may not improperly take the stand assumed by him who treats all men as rogues till assured of their honesty. It is just here that the pharmacist cultured in analytical methods meets the reward of his culture: he can purchase in the cheapest market, not feeling the necessity of paying for skill or reputation in another.

I will confine myself to one or two examples of the use of the microscope, taking them from the writings of other workers on the subject. The first that occurs to my recollection is the examination of scammony, described very ably by Mr. Greenish at the last Conference. You will remember that two very important questions are determined, according to the author, by the microscopical examination of scammony. The first is its adulteration by the presence of foreign matter, starch, and mineral matter. The second, equally important to the pharmacist in the long run, is the aid afforded to determining the quality of the article, for, as Mr. Greenish says, "From an examination of a variety of samples of virgin scammony from different sources, I may say as a result that the *lump* was in every instance free from the starch of scammony root or any other starch, and that every sample of *powdered* virgin scammony contained more or less of the scammony starch, and some of them a little wheat starch in addition." And he concludes, "that the presence of the scammony starch indicates an admixture of inferior scammony, and more especially when it is accompanied by some of the tissue of the root." Another example is the adulteration of powdered ipecacuanha by almond cake, where the sophistication was detected by other than microscopical means, but could have been done far more easily and certainly by the microscope. The cases of mustard, pepper, ground ginger, arrowroot, cayenne pepper, and other articles of like kind, will readily occur to every one; and here the microscope affords in some cases the only, and in all the best, means of detecting sophistication.

In Bristol one will naturally remember Stoddart's use of the microscope in conjunction with chemistry in the examination of quinine, and our worthy late President (Mr. H. B. Brady) will remind us of a too completely forgotten paper in the *Journal* of years ago on the microscopical crystals of certain opiate tinctures. Other applications to determination of varieties of drugs and the like would present themselves to us had we time; but as it is, a few words on the essentials to microscopical analysis, and I pass on. The first thing is a microscope, which need not be expensive. The

small "student's" or "hospital" microscopes now made on the French model by Swift, Baker, and other English makers, or the genuine Hartnack, with an inch and a quarter objectives, answer all ordinary requirements, and may be bought of very good quality complete for about seven or eight pounds, or with inferior lenses for about five pounds. In my own ordinary work I use a Smith and Beck's Universal, and am therewith content. Those who have the money to spare may very profitably add to the cheap microscope one of larger and more elaborate construction; but for the daily work of the laboratory the small, cheap, but good instruments are far the best, and it is economical in the long run to spend surplus money in lenses before spending any on stands of more ornamental than useful character.

The pharmaceutical use of polarized light lies in two directions:—(1) In conjunction with the microscope, where it is useful in helping in the detection of the adulteration of beeswax, spermaceti, etc., and of butter, as shown by me long since in the *Journal*, and to a limited extent in the examination of starches; and (2) in the examination of substances possessing what is known as rotatory power, that is the power which such substances possess of twisting (so to speak) round, or rotating, the plane of polarization of any beam of plane polarized light that may be passed through them. This branch of optical analysis has as yet been little used in pharmacy, nor do I know that its application is likely to be of extensive use to pharmacists in general so far as regards the detection of adulterations. As an instrument of research it is of course valuable, and may in that way prove of service in leading to scientific discoveries, or aiding in the production of highly pure drugs. Two or three instances in which its use has already been of note may be adduced.

The first that presents itself is Dr. de Vrij's employment of Wild's polaristrobometer (polarimètre) in the determination of the value of cinchona barks* and Popp's examination of castor oil.† In the examination of sugar syrups, where it is of the highest value, it will be of little use to pharmacists, who will find ordinary chemical tests quite equal to their requirements.

I have hinted that the general pharmaceutical use of polarized light is limited. There are several reasons why this is so. The first is that the substances possessing the specific rotatory power (optically active substances) are not very numerous in pharmacy,

* *Pharm. Journ.*, 3rd series, ii., 1.

† *Arch. Pharm.*, cxlv., 233.

and of these certain vary in energy, and direction of energy, so widely that the application of polarized light to their examination in ignorance of their history would only lead to erroneous conclusions. Take, for example, turpentine, which is said by all our text-books to possess the power of left-handed rotation (so accurate a writer as Spottiswoode quotes Verdet giving it as (a) $r - 29.6^\circ$). Now, if this were really the case, and the rotatory power were sensibly constant in all specimens, we should have within our reach very simple means for determining the purity of any given sample. We should merely have to put a little of it in a tube in our polariscope, and read off the angular deviation of the polarized beam. But, as Pereira showed as far back as 1845,* different specimens of authentic turpentine vary much, not only in degree of rotative energy, but in direction, so that it is possible by a mixture of different specimens to produce an optically inactive one, to which other observers have borne testimony; and it probably is not far from the truth to say that no two samples of commercially pure turpentine are at all likely to give the same polariscope reading. A similar case is, that of tartaric acid where we have dextro- and lævo- tartaric acid uniting to form the inactive racemic or para-tartaric acid, and frequently present in commercial samples of tartaric acid in this form where, although I presume we cannot call it an adulterant, it very successfully vitiates any optical analysis of the acid. It is, nevertheless, highly probable that there are many directions in which good use may be made of this method of optical analysis, if only some pharmacists, having that command of material which an outsider like myself cannot possess, would search them out. The cost of the research to such an observer would be very trifling, since the loss of material would be infinitesimal, and the results might be extremely valuable. To an outsider the case is quite different; the expense of examining a sufficient number of samples of, say, essential oils would be very considerable, and the difficulty, in many cases, of obtaining them not inconsiderable.

The last method of optical analysis of which I propose to speak (a fourth, consisting of the observations of fluorescence, I have not worked at) is that involving the use of the spectroscope. Here I must confess that I am helpless as the thing now stands. Many attempts have been made to use the spectroscope in the examination of tinctures, Mr. Stoddart being I believe the first to turn his attention in that direction, but so far I think no good has come of it.

* *Pharm. Journ.*, 1st series, v., 57.

Nevertheless in time there is hope. I have little doubt that if some young pharmacist, in these days of short hours, were to set himself to work at the spectroscopical determination of the colouring matter of the substances forming the basis of our tinctures, carefully mapping out their spectra, as examined singly and in combination, he would soon be able to place before us means by which we could identify them, and determine their presence or absence from any given tincture with comparative ease. Whether or no the spectroscope will then supersede chemical analysis in point of speed and convenience is of course a question that the event will only answer. The attempt is worth making, and will no doubt yield collateral information that will be worth the getting. The difficulty lies at present in the isolation of the constituents sufficiently to enable us to get at them, and to this point workers at the subject must, in my opinion first direct their attention. Early workers at the subject have too completely forgotten that the spectroscope is, after all, merely an instrument for colour testing; that it enables us to discriminate between colours closely allied, by separating them into their constituents; or that it renders single colour elements visible by separating them from others by which they are overborne.

If I have succeeded in awakening the interest of some one who will take up these branches of analysis, my writing this paper will not be in vain. In this hope lies my gratification. That a more competent man has not written it, is my regret, and doubtless yours also.

The PRESIDENT said that Mr. Pocklington seemed rather to limit than to extend the use of the microscope, for there were some applications of it which he did not think worthy of the analyst. He, however, confirmed the view of Dr. Carpenter in a lecture before the Pharmaceutical Society on the use of the microscope in the laboratory, that for daily work a cheap student's microscope was more useful than one of more expensive character. With regard to the spectroscopic application of the microscope in pharmacy, he himself had tried, and found his eyes were not equal to the occasion; he could not get the results he expected. He should like to ask Mr. Stoddart whether he now used the micro-spectroscope and derived any beneficial results from it.

Mr. STODDART said he used it continually, and found it more useful every day. His spectroscope was by no means a perfect one, but it answered his purpose very well. At the soir  e on the next evening, in the spectroscopes which would be under his direction, there would

be side by side three examples of the same objects under the micro-spectroscope: in one case adulterated port wine and genuine port wine; in another the juice of the lobelia and that of digitalis; and in the third the juice of annual and biennial henbane. Under the micro-scope, tincture of rhubarb and compound tincture of gentian were so much alike they could not be distinguished; but in their spectra they did not match, and there were clear indications of a difference. Similarly coloured substances, that at first appeared to be identical when treated with reagents, exhibited distinct differences in the spectrum. Mr. Sorby used sulphite of sodium, and it produced difference between two apparently similar objects. Whether the coloured substance were strongly or weakly coloured was of little consequence; but it could be stronger in a small tube three eighths of an inch in thickness than in a half-ounce phial, because in the latter case the greater body of the liquid would hinder the passage of the light through the liquid. Of the future of the micro-spectroscope there could be no doubt. The polariscope was applied to sugar analysis with very good results, as it exhibited differences which undoubtedly indicated variations in the value of the solutions of sugar.

Mr. ALLEN said that the successful use of the micro-spectroscope depended on the concentration of solutions and of management in the addition of reagents. In the micro-spectroscope exactly the same result was produced with blood as with cochineal. In its ordinary condition, blood gave under the micro-spectroscope a spectrum characterized by two dark bands in the green, and ammoniacal solution of cochineal gave an exactly similar spectrum. But the difference between the two spectra could be shown at once by the action of reducing and other reagents. The polariscope might be employed to detect the admixture of tartaric with citric acid, two varieties of the former being strongly rotatory, but the latter having no rotatory power. The polariscope was employed for that purpose by several London chemists.

Mr. SCHACHT said he would like to know whether it was claimed that the spectroscope was anything more than a test for colour. He understood Mr. Pocklington to say it was only a delicate test for colour, but Mr. Stoddart seemed to consider it something more.

Mr. STODDART said that solutions of the same colour to the eye would give different bands.

The PRESIDENT asked whether if, to a normal solution of annual or biennial henbane, an addition was made of hyoscyamine in solution, that would alter the position of the bands.

Mr. STODDART said he did not like to say yes or no; he had not tried.

Mr. SCHACHT asked whether with green solutions presenting apparently the same amount of colour, the spectroscope would reveal that one was a chlorophyl and the other a mineral colour.

Mr. STODDART said distinctly, yes.

Mr. SCHACHT said, then the expressions of Mr. Pocklington would require modification, for the instrument was not simply a test for colour.

Mr. WILLIAMS said that Mr. Waddington had made some experiments in the extraction of colouring matters from dye woods by means of castor oil, and the solutions so obtained produced bands totally different from those of solutions in alcohol, water, or any other medium.

Mr. STODDART said castor oil made an optical difference, but pure turpentine had no action in the polariscope.

Mr. ARMSTRONG had used the polariscope for a long time, but to show how easy it would be for those inexperienced to make mistakes, he would tell them that even after a dinner at which anything strong had been eaten, say, as a striking example, onions, they would find these results many points different after than before that meal. In its use many things had to be taken into consideration. Most chemists had discarded it for a long time, except as a proof test, and had fallen back upon chemical tests.

The next paper read was a—

NOTE ON THE PRESERVATION OF HYDROCYANIC ACID.

BY JOHN WILLIAMS, F.C.S.

In the communication I had the honour of making to the British Pharmaceutical Conference at its last meeting, upon the preservative action of glycerin upon hydrocyanic acid, I had two objects in view: first, to prove the *fact* that glycerin *did* act as a preservative to the acid; and, this being admitted, secondly, to determine if possible what percentage of glycerin was best adapted to produce the effect. For this purpose hydrocyanic acid of strengths varying from 16 per cent. to 2 per cent., and mixed with glycerin from 50 to 14 per cent., were kept under varying conditions, and tested at frequent intervals, and the results given in a tabulated form proved, first, that the glycerin has decidedly the property of preserving hydrocyanic acid, and, secondly, that, although the stronger percentage

acids weakened more rapidly than the weaker or Pharmacopœia strength, still the percentage of glycerin did not sensibly alter the ratio, and the conclusion arrived at was that the hydrocyanic acids of various strengths, but containing 14 per cent. of glycerin, were as perfectly preserved as those containing 50 per cent., and a general result was arrived at, that probably 20 per cent. of glycerin would be found in practice to be a good proportion for use. To settle this question it was desirable that further experiments should be made, the result of which I now submit to the Conference. On July 31st, 1874, two samples were most carefully prepared, one containing 4·5 per cent. of real hydrocyanic acid (to represent Scheele's strength), the other exactly 2 per cent., representing, therefore, B.P. Each contained an addition of 20 per cent. of Price's pure glycerin. These samples were each about ten fluid ounces, and contained in pint white glass stoppered bottles, not tied over or inverted, but kept in a cool dark closet; the conditions were purposely arranged to represent as nearly as possible the ordinary ones of the dispensing counter; of course the bottles were kept tightly stoppered, and were only opened twice during the period of trial.

These samples of acid were tested on December 23rd, and found not to have changed in any way; again, on July 30th of this year, or at the end of one twelvemonth, they were again carefully tested, and no appreciable diminution in strength could be detected in either sample. I have them still, and shall continue to have them tested at intervals, and it will be interesting to know when, if ever, a diminution of strength will take place. I have also had another experiment tried, which has proved, I think, of great interest. I thought it important to know how long very strong hydrocyanic acid could be preserved by 20 per cent. glycerin; for this purpose a sample was made with 20 per cent. glycerin and concentrated acid, and the liquid when tested gave 26·8 per cent. of real acid. This was on July 31st, 1874. Unfortunately, Price's pure glycerin was not employed in this experiment, but some of German origin (said to be distilled and pure); it was at the end of one day observed that the liquid had assumed a light yellow colour, but as this colour did not appear to deepen it was supposed to be of no consequence, and I may mention that I have since tried the effect of hydrocyanic acid upon several samples of German glycerin, and find that a yellow colour is always produced, even when the acid is only 2 or 4 per cent. in strength, Price's pure glycerin remaining always perfectly colourless.

This sample of strong hydrocyanic acid was tested on December 23rd; it was still of the same colour, and proved to be of 24 per

cent. strength. Thus in five months it had lost only 2·8 per cent. The bottle was again placed in the dark cupboard. (I may mention that this bottle of very strong acid was kept tied over, in other respects the conditions were the same as with the experiments with the weaker acids, and was not looked at until February 22nd, 1875, when it was found that it had entirely decomposed, and was now a solid black mass, smelling faintly of ammonia, and quite free from all traces of hydrocyanic acid.) It would have been very interesting to have known exactly when this change occurred, and to have watched it, but this unfortunately was missed the opportunity of doing. Some cause of disturbance must have upset the equilibrium of the constituents of the acid, probably when the bottle was opened in December, and the decomposition occurred very shortly afterwards. If possible, to throw light on this point, I have lately had a fresh experiment set on, taking the precaution, however, to use 20 per cent. of Price's glycerin, not German, and the liquid contains 32 per cent. of anhydrous acid at this moment. No discoloration has as yet occurred, the bottle is kept tied over on a shelf exposed to diffused daylight, and not in a cupboard, for I wish to observe, if possible, the change, whenever it may occur. If the Conference will permit me I shall be happy to report to the next meeting the result of this experiment. My friend, Mr. Miles Smith, is trying an experiment with salicylic acid as a preservative; it appears to keep the hydrocyanic acid colourless, but I am not in a position to give any further particulars of the experiment at present. He has also tried the experiment of preserving pure aldehyde by means of glycerin. It appears to answer. Probably many easily decomposed organic substances can be preserved by this means.

One more point, and I have done. The use of glycerin has been objected to for internal administration, and I am quite willing to admit that the advisability of the internal administration of glycerin is open to question; but when it is considered that an ordinary dose of hydrocyanic acid is about five drops, and that such a dose would contain but one drop of glycerin, I think it must be admitted that the effect of the glycerin would be quite insignificant, medically speaking, and need not be taken into account in determining whether glycerin shall be authoritatively used in the preservation of hydrocyanic acid or not.

The PRESIDENT said that this was a second contribution to the Conference on the subject, and it exhibited a great amount of careful research.

Mr. SIEBOLD said he supposed the result of the influence of glycerin could only be explained in this way: spontaneous decomposition was prevented or retarded. It seemed to him it could have no influence on volatilization. But the deterioration of the officinal hydrocyanic acid was due mainly to loss by evaporation, and not to spontaneous decomposition. In the samples of the stronger acid decomposition might be the main cause of deterioration. He should like to ask whether experiments showed that volatilization of the acid was also prevented by the addition of glycerin. He believed if the bottle produced had been opened frequently, as they had to open bottles in dispensing, the preservative effect of the glycerin would have been reduced.

Mr. WILLIAMS said he had simply recorded facts. The bottles had been opened only once at the end of six months, to test the contents, which were then as strong as when first put in. It was simply a fact that they were preserved under these conditions. No special means were adopted to preserve them; they were not kept tight specially to prevent evaporation. His own theory of the matter was that, as in essential oil of almonds and in cherry laurel water, which contain hydrocyanic acid, the acid remains permanent and unchanged, so he thought the glycerin acted mechanically, not only in preserving the acid from decomposition, but also in retarding its volatilization.

Professor ATTFIELD then gave a short *résumé* of the following paper on—

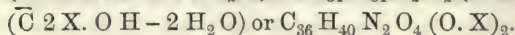
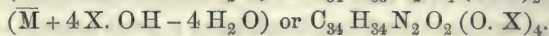
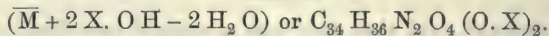
NEW DERIVATIVES FROM THE OPIUM ALKALOIDS.

By C. R. ALDER WRIGHT, D.Sc., LOND.,

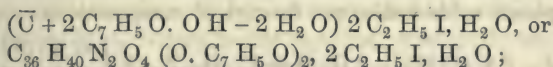
Lecturer on Chemistry in St. Mary's Hospital Medical School.

During the last twelvemonth the following results have been obtained (mostly conjointly with Mr. G. H. Beckett):—

In continuation of the experiments communicated last year on the action of acetic acid and anhydride on morphine and codeine, the actions of benzoic and butyric acids and anhydrides have been examined, with this general result, that compounds are formed expressible by the general formulæ—



\bar{M} and \bar{C} standing for morphine ($C_{34}H_{38}N_2O_6$) and codeine ($C_{36}H_{42}N_2O_6$) respectively, and X.OH standing for either acetic, butyric, or benzoic acid. In this way have been formed *dibutyryl codeine*, *dibenzoyl codeine*, *dibutyryl morphine*, *tertrabutyryl morphine*, *dibenzoyl morphine*, *tetrabenzoyl morphine*, and a mixed acid derivative, *acetyl-butyryl morphine*, intermediate between a diacetyl morphine and dibutyryl morphine, and forming another proof that the ordinary formulæ of morphine and codeine must be doubled. Moreover, it has been found that three different isomeric diacetyl morphines can be obtained, whilst *mono-acetyl morphine*, *tetra-acetyl morphine*, and *diacetyl codeine* have also been examined. Most of these bodies are crystallizable, and form crystallizable salts; with iodide of ethyl the free bases readily combine (on heating to 100° for a few minutes in a sealed tube), forming ethiodides, for the most part crystallizable with one proportion of water of crystallization, and containing as many equivalents of ethyl iodide as there are N symbols in their formulæ. For example, *dibenzoyl codeine ethiodide* is represented by the formula



and similarly for all the others.

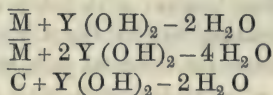
Physiological experiments on the acetyl derivatives of morphine and codeine have been made by Dr. F. Pierce, without, however, the discovery of any new action or valuable therapeutic or other properties; for the most part these derivatives resemble deoxy-morphine and deoxy-codeine in their action, differing somewhat from morphine and codeine in these respects.

The polymerides of morphine and codeine also yield acetyl derivatives by the action of acetic anhydride, polymeric with the corresponding derivatives of ordinary morphine and codeine; *tetra-acetyl-idcodeine* forms a readily crystallizable hydrochloride, but differs in several respects from the sub-polymeric diacetyl codeine, whilst the higher polymeride, *octacetyl tetra-codeine*, is much less basic in its character than tetra-codeine; it will not thoroughly neutralize hydrochloric acid so as to form a normal hydrochloride, nor does it form a normal platinum salt; and on treatment with ethyl iodide it only partially combines with it, not to the extent of one equivalent of ethyl iodide for every N symbol in the formula. This character seems general in the tetra series of derivatives of this class, being also exhibited by acetyl tetra-morphine derivatives.

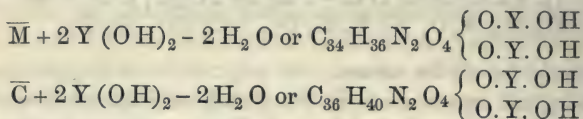
Attempts to synthesize higher homologues of codeine and morphine by acting on their acetyl derivatives with sodium ethylate

and analogous bodies led to no result; instead of acetyl being replaced by ethyl, forming ethyl-codeine, ordinary codeine was simply reproduced, and partially polymerized to tetra-codeine. In the course of these experiments it was found that the simplest way of preparing tetra-codeine is to boil a solution of codeine in benzene with a little ethylate of sodium (caustic soda will answer, but gives a less pure product); the tetra-codeine thus formed is purer than that produced by the action of acids as described in former papers.

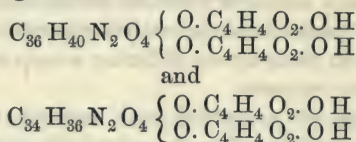
The action of polybasic acids on codeine and morphine is not that which might be anticipated from the results obtained with monobasic organic acids; *à priori*, the production of the bodies—



by the action of bibasic acids might be anticipated; $Y(OH)_2$ standing for any bibasic acid. But on trying the experiment with succinic and camphoric acids bodies are formed of compositions—



Thus succinic acid gives the derivatives—



with codeine and morphine respectively. These derivatives are peculiar in character; from one point of view they are acids, half of the acid radicals CO_2H contained in the succinic acid being present unchanged; from another point of view they are bases, being derivatives of alkaloids where the extra combining power of the nitrogen is still retained. Accordingly, they appear to be capable of forming two classes of salts, one with alkalies, the other with acids; the latter are, however, more readily isolated and crystallized, whence it would seem that the basic tendencies predominate over the acid characters. Analogous bodies result when camphoric acid is used. Tartaric acid, however, does not form derivatives of that kind; it polymerizes codeine, and forms a tartaric derivative somewhat resembling octacetyl tetra-codeine, and, like it, deficient in

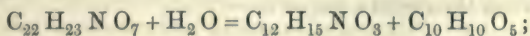
acid combining power. Oxalic acid on the other hand, produces neither kind of derivative, or if it does, the bodies thus formed immediately break up into carbon oxide and dioxide, codeine or morphine being reproduced, and immediately polymerizing whilst in the nascent state, so that the polymerides thus formed are the sole products that can be recognized.

With the alkaloid narceine it has been found that the sulphate is, like the hydrochloride, decomposed by the action of water, forming basic compounds; the action of acetic anhydride removes the elements of water, forming a new crystallizable base, $C_{23}H_{25}NO_7$ (i.e., containing $2H_2O$ less than narceine); ethyl iodide combines with narceine, forming an ethiodide converted by silver hydrate into a caustic alkaline liquor consisting of the ethyl hydrate; this somewhat readily breaks up into alcohol and ordinary narceine; and in fact all the addition-derivatives of narceine, including its salts, are characterized by a tendency to break up into their proximate constituents, viz., narceine and the added substance. By the action of nascent hydrogen narceine loses oxygen, forming an uncrystallizable new base. According to experiments not yet published, narceine by treatment with caustic potash yields *protocatechuic acid*; and as this acid is also obtainable from narcotine, it results that probably there is some community of constitution between these two alkaloids, a circumstance *à priori* probable for all the opium alkaloids, but hitherto not proved saving in the case of morphine and codeine, which have been shown by former experiments to be closely connected together as regards constitution.

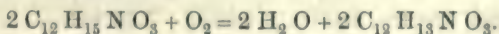
By acting on *cotarnine* with nascent hydrogen, a base is produced by the reaction



This substance is identical with the *hydrocotarnine* described recently by Hesse as extracted by him from the waste liquor of morphine extraction from opium. Pursuing this subject, it has been shown that when narcotine is acted upon by water it *breaks up into opianic acid and hydrocotarnine* thus—



the opianic acid becoming reduced to *meconin* ($C_{10}H_{10}O_4$) by secondary reactions, due to the partial decomposition of the hydrocotarnine; if oxidizing agents be present (as in the ordinary processes for preparing opianic acid from narcotine), the *hydrocotarnine* is oxidized to *cotarnine* thus:—



Hence in these processes opianic acid and cotarnine are the end results, whilst with water alone hydrocotarnine and meconin are formed. (Some years ago the production of meconin in this way was shown to take place by the late A. Matthiessen and the writer, but the complementary product was not then recognized as different from cotarnine.) In this way the occurrence of meconin and hydrocotarnine in the opium liquors is readily accounted for by the decomposition of the narcotine during the various processes; and it seems not unreasonable to suppose that the formation of many other substances isolated from such liquors, and usually regarded as proximate constituents of opium, may hereafter be similarly accounted for, so that the proximate constituents of opium may not be so numerous as is generally supposed.

Dr. F. Pierce has established a well-marked difference in physiological action between cotarnine and hydrocotarnine; whilst the former produced no perceptible effect when subcutaneously injected into kittens, rabbits, and guineapigs in doses up to 5 decigrams, similar doses of the latter produced epileptiform convulsions, and usually death in a few minutes; the addition of hydrogen has therefore greatly augmented the physiological activity of cotarnine (when hydrocyanic acid is converted into methylamine by the action, $\text{C N H} + 2 \text{H}_2 = \text{C H}_3 \cdot \text{N H}_2$ the physiological activity is greatly diminished).

A number of further experiments on the derivatives of narcotine, cotarnine, hydrocotarnine, narceine, and papaverine, are now in progress, and will in due course be brought before the Conference. The materials for these prolonged researches have been most liberally furnished by Messrs. Macfarlan & Co., of Edinburgh, whose kindness the writer desires again to acknowledge.

The PRESIDENT, in thanking Dr. Wright for the paper, said he was afraid he could not quite appreciate it. The immense variety of new matters described made it very desirable that work of this sort should be repeated by others.

Mr. BENDER then read a paper on—

ROYER DE LA BASTIE'S TOUGHENED GLASS.

BY HENRY POCKLINGTON.

Royer de la Bastie's "tempered," "toughened," or "hardened," glass (for we have a choice of terms), is simply glass that has been heated to softness and plunged into an oil bath of a "certain temperature," and thereby suddenly cooled. The process is extremely

simple, but for its performance on a manufacturing scale will require, the patentee claims, the machinery described in his specification. This document has attained the rare honour of a second edition, showing that considerable public interest has been taken in the invention, and having regard to this, and the wide publicity given to the general features of the invention, it is not, I think, necessary to occupy the time of the Conference with details respecting either the process or the machinery for its application. The essentials are, heating the glass to a high temperature and plunging it into a bath of a certain temperature and composed of certain materials. The specification does not state the temperature to which the glass must be heated, except somewhat vaguely, and leaves us in entire doubt as to the temperature of the bath. The materials claimed, in the specification, of which the bath is to be, or may be, composed are oils, fats, resins, and tars, and other like substances, boiling at a higher degree than water. From this it has been inferred that the process of hardening is a chemical one, and that "the glass takes up some of the constituents of the bath," but I do not see that this conclusion is supported by the specification in which the patentee expressly, and I think in part correctly, explains the process on the hypothesis that the molecules of the glass are compressed in the act of sudden cooling, and his use of oleaginous substances has been chosen on account of their high boiling points, without reference to any chemical property or affinity they may have.

My work on the glass may fall under two heads: I first endeavoured to ascertain its structure by means of polarized light, and then experimented upon its manufacture on a laboratory scale.

As regards the first of these points, the structure of the glass, the thought immediately presented itself that this was a particular case of Rupert's drops, or in other words, of molecular instability in temporary restraint, and this view is much supported by the phenomena attendant upon the disruption of the glass, which, as you all know, flies into a thousand pieces when its continuity is broken in the least. But this view is repelled with some indignation by the apologists of the process, and does not appear to be wholly consistent with the phenomena, unless as is probable, De Luynes' theory of the nature of Rupert's drops be the correct one, and we look upon the toughened glass as an extreme modification of them.

If we examine a strip of glass prepared strictly in accordance with Bastie's process, between Nicol prisms, we shall find that it behaves in all essential respects as unannealed glass, excepting that the "permanent bands" seen when the prisms are not crossed do not

occur so irregularly as in unannealed glass, and that the "brushes" are remarkably strongly defined. In other words, the toughened glass manifests the phenomena of a well formed and evenly balanced crystal in a more marked degree than ordinary unannealed glass. This is brought into striking prominence if we contrast with Bastie's glass a strip of glass of similar dimensions prepared by cooling between a thick and a thin metal plate, or between a thick metal plate and the bottom of a thin vessel containing water. In the latter case we shall notice that the "isochromatic" lines or "permanent bands" are irregularly localized and very differently defined in various portions of the plate. In these experiments we transmit the light from back to front of a thin strip, and consequently have to do with but a thin stratum of the glass, and can gain little knowledge of the state of the internal layer save as that may differ over superficial extension, and we learn so little hereby that I have not thought it desirable to trouble you with details respecting the phenomena observed. We gain much better results when we send the polarized light through a strip parallel with its face; we can thus explore the whole interior without serious interference by the superficial layers. The method pursued is this. I take a strip of toughened glass about three quarters of an inch wide and of any convenient length. The opposing surfaces through which the light has to be transmitted must be ground plane and parallel. If not, the one polished surface should be cemented to a glass slide with Canada balsam, the slip of toughened glass standing upright, and the other surface covered with a piece of microscopical thin glass cemented on with balsam. The front and back of the glass may be blackened, or screened, to exclude extraneous light, and the carrier should also be blackened so that no light shall enter the analyzing prism save such as has passed through the strip of toughened glass. If this be now placed on the stage of the polariscope we shall be able to examine it with ease. The phenomena are briefly these:—If we use the monochromatic sodium light, we observe that the centre of that strip is dark when the prisms are crossed, and that it is surrounded by alternating lines of light and dark gradually becoming narrower as they approach the surface. By polychromatic light, daylight for example, the centres of the strips I have examined have usually been red or green (crossed or not crossed prisms), the lines in this case resembling the chromatic rings of Newton's series seen in transverse sections of crystals in the field of the polariscope. These lines are really portions of extremely elongated ellipses, as may be seen if they be traced to the end of the strip, and round it. The

centre is evenly coloured in well-tempered specimens, and the "lines" remain sensibly parallel for considerable distances, but in ill-prepared specimens, as prepared by the method indicated, the colour of the centre varies much, the lines are less well defined, often not so numerous on one side of the central (eccentric then) portion as on the other, and are not sensibly parallel for any appreciable distance; in fact, it is quite easy to tell by polariscope analysis whether the glass is really well toughened or whether only "unannealed." Now, in the difference between these kinds of glass, may, I think, be found the secret of the phenomenon of "hardening." We have, in a few words, in the case of tempered glass, a strip of glass consisting of exconcentric layers of very different density, in a state of different stress, encircling a central portion which is almost sensibly common glass; it may, in fact, be regarded as a trussed girder composed of thin plates, considerably elastic, but with weak trusses. When these give way the girder flies asunder, but till they do, it is remarkable for its strength. This, according to De Luynes, is essentially the structure of Rupert's drops. But there appears to me to be this difference between them. According to De Luynes the interior layers of Rupert's drops are the contracted layers, the exterior the dilated; whereas in toughened glass, I have, I think, abundant reason for supposing that the contrary is the case. The polariscope phenomena indicate increasing compression towards the exterior, microscopical examination of fractured portions, especially when ill-tempered, shows curves indicating compression by the exterior, and the disruption of such specimens frequently assumes a character only explicable on the theory, which is further supported by Bauer's determination of the sp. gr. of specimens prepared by him (in paraffin) where the sp. gr. increased from 2.424 before hardening to 2.438 after, and from 2.460 to 2.468 in another specimen. I may remind the Conference that De Luynes has recently shown that Rupert's drops of fused boracic acid are distinctly foliate in structure, and has quite confirmed his previous opinion that such was the character of the glass Rupert's drops, and that their stability, when entire and complete, and disintegration when injured, is due to the gathering up and centralization of the various lines of stress and strain in a portion of the drop near the neck (not in the thin part of the tail, as generally supposed).

The foliate character of Bastie's glass is quite supported by the appearance under dissection, but I have made no personal observation on this point which I can consider sufficiently valuable to be worth communication in any detail.

To sum up this part of the subject, we find that Bastie's glass is glass in a state of mechanical compression; that it may be regarded as a stressed or trussed girder, that it is the outside which compresses the inside, and that the outside is much harder than the inside; and, finally, that it differs from unannealed glass and from Rupert's drops in the even distribution of its lines of stress, and in their regular and concentric compression of the interior.

My account of the result of my experiments under the second point, the manufacture of the glass, must not occupy much time. I have simply attempted to discover the essentials necessary to success. I very soon found that it is absolutely necessary to raise the glass to a high temperature, that it must be made quite soft, but that a wide range of temperature may be allowed in the bath. I found, for instance, that good specimens could be prepared with oil at 50°C . when the glass was thin (common window glass) and very hot, and I found little difference between one kind of oil and another. I then turned my attention to other fluids than oil (excluding fats and tars), and found that neither water nor aqueous solutions, alcohol, or similar mobile fluids, will at all answer, whatever be the temperature to which they be raised; but I found (and this may be of importance if the manufacture of the glass prove to be profitable) that very good tempering can be done without the use of a bath at all. A brass plate one eighth of an inch thick, supported on brass legs, is heated to 100°C ., or thereabouts, the hot glass placed upon it, and immediately covered with a similar piece of metal. This glass is not so hard as Bastie's, but on the other hand it does not fly into such minute fragments when disintegrated, and it is vastly harder than common glass. Still better results are obtained by placing the glass between thin metal vessels containing heated oil or even water. From this I draw the conclusion that the essential to the process is this, that the glass shall be very rapidly cooled for a *very* short space of time, and that the cooling shall thenceforward be gradual. If we watch the process in oil placed in a glass vessel we shall see that although rapid convection currents set in, and cooler masses of oil are rapidly brought into contact with the glass, yet these are incomparably less rapid and far more regular than what occur when water is employed. In this case, the water in immediate contact with the glass is raised into steam, absorbing an enormous amount of heat, and escapes rapidly, bringing fresh and irregular portions of cold water into contact, when the same again occurs. The comparatively low specific heat of oil is also probably an important factor in the case.

It would be out of place here to offer any remarks on the probability of the practical advantages of Bastie's discovery, and I will conclude by expressing my regret that I have not been able to place the subject before the Conference with the completeness I wish. I must also express my regret that the results of De Luynes' investigation of the subject have not yet been made public, and that I am in entire ignorance of either his methods of research or the results he has gained.

The PRESIDENT said that pharmacists, of all men, were interested in this subject, because they used glass vessels so largely. He did not know whether this invention was applicable in the case of hollow goods. He should be happy to have some specimens and to experiment upon them. Great credit was due to Mr. Pocklington for being the first to examine the glass optically, and investigate its structure. It was curious to remark that instead of being like Rupert's drops it was exactly the opposite.

Mr. BRADY said that he had had an opportunity a little while ago of talking over the subject with a director of a public company that proposed to take in hand the manufacture of M. de la Bastie's glass on a large scale. He was surprised to learn that the company had originally taken the matter up on the ground of the relative cheapness of the new method of annealing. Plate glass had already been experimented upon, and it was found to be quite easy to apply the toughening process to it. The difficulty began after that; when the glass was toughened it was impossible to cut it with a diamond in the ordinary way; it was necessary to use a lapidary's wheel and diamond dust to reduce the plate to the required size. There were many mechanical difficulties still to be overcome. In the case of hollow vessels, for example, the question had still to be solved how to present both sides of the glass (inside and out) to the action of the oil bath simultaneously, which appeared to be a condition essential to success—a tumbler, for instance, could be managed, but a decanter was not so readily treated. He described the extent of rough usage the toughened glass would bear, and stated that, notwithstanding the limitations which seemed at present imposed by mechanical difficulties, there could be no doubt that it would be largely used for pharmaceutical appliances.

Mr. MACKAY quite agreed with all that had been said by Mr. Brady in connection with hardened glass. He might, however, further state that while the surface was so hard that no diamond could cut the surface, he had seen specimens which had been engraved by the

sand blast. Another peculiarity which had been omitted might also be referred to, namely, that the process seemed to destroy its power of conducting heat. Thus, a good thick rod of the prepared glass might be made red hot at one extremity, and remain quite cool an inch or two beyond the redness. He had also seen printing types made of this glass, which promised to interfere very much with the use of the ordinary metal in printing. Indeed it was almost endless to think of the variety of uses to which the new material might be put, if the few difficulties still in the way were overcome.

Mr. BRADY said there was also a difficulty in preserving the shape of glass vessels while transferring them from the furnace to the oil, but this doubtless would be eventually overcome by mechanical means.

The last paper read was on—

COMPOUND COLOCYNTH PILL (COMMERCIAL).

By WILLIAM LAIRD.

In the list of subjects for research issued by the British Pharmaceutical Conference I find the following:—

“The Pills of Commerce: Are they according to the P.B.?” As a contribution to the elucidation of the question I beg to contribute the following report on the composition of some samples of pil. colocynth. co.

Two or three years ago my attention was called to the low price at which some colocynth pills were being offered to medical men, namely, one shilling per gross, and the question arose, Can we find out the explanation of this business? Never having seen any account of the analysis of colocynth pills, I could not put into practice any known process of examination, though sure that the pills in question could not be properly compounded. I therefore devised the following method. Taking advantage of the different solubilities of scammony and aloes in ether and proof spirit, I took a weighed portion of the official pill mass, dried and ground it, packed it in a Dobereiner's percolator, exhausted first with ether, then with proof spirit, weighing each product after drying. The product by ether I take to represent approximately the scammony, that by proof spirit the aloes and a portion of colocynth, the insoluble residue the colocynth and inert matters natural to the materials used. I have tabulated the results of the analyses of these pills and of some other samples as follows:—

	Soluble in Ether.	Soluble in Proof Spirit.	Insoluble Residue.
P.B. . . .	38.8	49.2	12.
No. 2 . . .	12.6	58.3	29.
„ 3 . . .	13.5	63.5	27.5
„ 4 . . .	12.5	72.5	15.
„ 5 . . .	19.	31.5	49.5
„ 6 . . .	13.	64.5	16.5
„ 7 . . .	6.5	69.0	24.5
„ 8	(very bad.)		

No. 5 contained a notable quantity of calomel. No. 8 was so evidently a sophistication I did not examine the pills as I did the others. They consisted mainly of gamboge, Cape aloes, colocynth, and starch. The latter I was at a loss to account for, but since then have fallen in with a low priced sample of colocynth which contains a very large proportion of starch of same kind as I saw in these pills.

The others had, I presume, been made, of course most unjustifiably, with the so-called Aleppo scammony.

After a short conversation, the PRESIDENT said it would be useless to discuss the paper in the absence of Mr. Laird, as there were no means of determining whether his remarks applied to compound extract of colocynth or to compound colocynth pill.

This concluded the list of papers to be read.

CONCLUDING BUSINESS.

The PRESIDENT said they had now to determine the place of meeting for 1876, and to elect the list of officers for the year. Ballot papers containing the list of officers recommended by the committee would be distributed, and members could of course alter them by substituting other names if they wished. The paper could be filled up while other business was proceeded with.

Mr. Bostock and Mr. Walter Hills were appointed scrutineers to collect the ballot papers, retire, and report the result.

Professor ATTFIELD read a letter from Mr. William Greig, president, and Mr. J. M. Fairlie, hon. sec. of the Glasgow Chemists and Druggists' Association, inviting the Conference to meet at Glasgow next year. Professor Attfield said if the Conference had no other inducement than this courteous invitation, they would feel bound to give the communication the very utmost consideration, and accept if possible. But the British Association would meet at Glasgow

next year, and that fact gave additional value to the invitation. He was certain the Conference would experience a cordial welcome similar to that which it had experienced in Bristol and elsewhere; and he would move:—

“That the courteous invitation of the Glasgow Chemists and Druggists’ Association be accepted, and the meeting of the Conference for 1876 be held on the days immediately preceding that of the meeting of the British Association for the Advancement of Science.”

Mr. CARTEIGHE seconded the motion, and said he was sure the Conference would receive such a welcome as it had already received at Dundee and Edinburgh. It was a source of satisfaction to see present on that occasion so large a number of gentlemen from Edinburgh; it was an indication that the brethren in Scotland would receive the Conference most cordially.

The motion was put and agreed to.

Mr. MACKAY said he had been asked to move a vote of thanks to the local committee of Bristol, and he felt it both a privilege and an honour to have been requested so to do. Not long ago great interest had been excited throughout the country by the picture now known as the “Roll Call in the Crimea.” Nations, societies, and individuals have, however, their roll call too, and we find from the roll call of the British Pharmaceutical Conference that this was its twelfth meeting. Looking to the past and in some respects to the future, he felt quite confident that as time moved on and the history of this Association was looked at, the year 1875 would be prominent in the foreground of the picture. So far as the meetings had gone they had been a great success. He felt therefore, as he was certain the other members felt, great indebtedness to the local committee who had received the Conference so well. As time pressed he would content himself by moving:—

“That the most cordial thanks of the non-resident members of the Conference be given to the Bristol members of the Conference generally, and especially to Mr. Boorne, Mr. Schacht, Mr. Stoddart, Mr. Pitman, and other members of the local committee, for their untiring and most successful efforts in organizing the present meeting; and for the kind and thoughtful way in which all arrangements have been made.”

Mr. ATKINS seconded the motion, and said that his doing so was no matter of form. He regretted that his duties as Mayor of Salisbury had prevented him from hearing the presidential address; and he expressed a hope that some members of the Conference, as

members of the British Association, would join the excursion to Salisbury and Stonehenge, where he would give them a hearty welcome. The Conference had been a thorough success, the papers and discussions had been most practical, and they would be highly appreciated by a large constituency outside.

Professor ATTFIELD said he should like to support the resolution before the meeting, as the officer of the Conference who had corresponded most with the gentlemen named in the resolution and with the local committee. In his opinion the Conference had been much benefited by its visit to Bristol. He was not surprised to find it had been so benefited, because he knew well the great interest in pharmacy and in the British Pharmaceutical Conference which had always been taken by Mr. Stoddart and Mr. Schacht; and he had heard of the power of organization of Mr. Pitman, though he had no idea he possessed it to the extent which had been so apparent to all present. Again, he was not surprised, because he knew how well the local association and committee had been supported by Mr. Boorne and Mr. Townsend. In recognizing the efforts of those gentlemen to promote the well-being of the Conference—efforts which had been most successful—their extreme thoughtfulness in obtaining the use of the Volunteer Club next door, and the liberality exercised there and elsewhere should be remembered; together with the great convenience of the room in which the Conference had assembled. It must be obvious that the Conference had seldom met in a room better fitted for the purpose. He cordially supported the resolution.

Mr. BENDER said he would ask for the opportunity of expressing his personal thanks to the local committee, and especially to Mr. Pitman, for the kind way in which the Conference had been treated. He hoped the local committee would have some satisfaction in remembering what a successful meeting had been held in Bristol.

The resolution was put and carried with acclamation.

Mr. Boorne responded for the local committee, and said they were amply repaid for their efforts by the success of the Conference. If the members had gained anything by coming to Bristol, the local Pharmaceutical Association had gained much by the visit. It would encourage them greatly for the future, and stimulate them, he hoped, to future efforts in scientific research.

The scrutineers now reported that they had examined forty-nine papers, and forty-eight were identical. One member had proposed Mr. Schacht as president for next year. With that exception the following list of officers was elected unanimously:—

ELECTION OF OFFICERS.

President.

Professor REDWOOD, London.

Vice-Presidents.

T. H. HILLS, F.C.S., London.

R. REYNOLDS, F.C.S., Leeds.

E. C. C. STANFORD, F.C.S., Glasgow.

D. FRAZER, Glasgow.

Treasurer.

G. F. SCHACHT, F.C.S., Clifton.

General Secretaries.

Professor ATTFIELD, F.C.S., London.

F. BADEN BENDER, F.C.S., Manchester.

Local Secretary.

A. KINNINMONT, Glasgow.

Other Members of Executive Committee.

M. CARTEIGHE, F.C.S., London.

C. EKin, F.C.S., Bath.

J. R. YOUNG, Edinburgh.

C. BOORNE, Bristol.

J. WILLIAMS, F.C.S., London.

W. A. TILDEN, D.Sc., F.C.S., Clifton.

C. UMNEY, F.C.S., London.

T. DAVISON, Glasgow.

J. M. FAIRLIE, Glasgow.

Auditors.

J. PITMAN, Bristol.

J. MACMILLAN, Glasgow.

Mr. WILLIAMS said he moved with great pleasure—

“That the thanks of the Conference be given to the Committee of the Volunteer Club for their kindness in placing their rooms at the service of the members.”

Mr. BOURDAS seconded the motion, which was cordially assented to, and Mr. Schacht asked that he might be authorized to convey it to the Committee of the Club who had immediately assented to his request to place the club at the disposal of the Conference.

Mr. BRADY moved—

“That the thanks of the Conference be offered to the Committee of the Museum and Library for the use of their room for the meeting.”

Mr. SHAW seconded the resolution, which was unanimously agreed to.

Mr. HILLS, who was loudly cheered, said it was his privilege to propose the next resolution, which was a vote of thanks to the President for the ability and courtesy with which he had discharged the duties of that office and conducted the business of the Association.

Mr. EKIN said he seconded the motion with great pleasure, observing that they knew before that Mr. Groves was a pattern pharmacist, and he had proved himself to be as well a pattern president, by his addresses from the chair, his conduct of their meetings, and the aptitude with which he had directed their attention to points raised for discussion by the papers that had been read.

Mr. STODDART supported the motion, which was carried by acclamation.

Mr. GROVES in responding said he was pleased the meeting had come to a satisfactory termination. If he might judge from the plaudits and from what had been said, the Conference had been satisfied with the conduct of the meeting, but for that very little was due to him. He had endeavoured to do his best, and if the members were satisfied he was pleased. If he could persuade himself that he had been of any material benefit, he should be indeed proud. He had not been the motive power, but owed everything to the active secretary on his right (Professor Attfield) and to Mr. Benger. They had really organized everything, and nineteen twentieths of the work had fallen on the shoulders of Professor Attfield. The little he himself had done, he had done *con amore*. He was pleased the meeting had been a success, and that he had in any way contributed to that success.

Mr. BRADY said there remained at least one duty which seemed to have been forgotten. He should not like the Conference to separate without saying how much it owed to its secretaries, Professor Attfield and Mr. Benger, and especially, partly owing to his position in London, and his long connection with the Pharmaceutical Society, to Professor Attfield. He was sure the Conference would not like to break up without expressing in the most outspoken way its sense of obligation to the secretaries, particularly to Professor Attfield, for the services they had rendered for so many years.

Mr. STODDART heartily seconded the vote of thanks.

Professor ATTFIELD briefly acknowledged the warm and cordial recognition of his services.

Mr. BENDER also responded, and the proceedings then terminated.

Friday, August 27th.

Friday, was occupied with an excursion, thoughtfully and liberally arranged by the Local Committee. A special train conveyed the company (about 120 in all, including about a dozen ladies) first to Wells. About two hours were occupied in this ancient city, the cathedral and the palace grounds monopolizing most of the attention. The train then proceeded to Cheddar, and after a light luncheon at the station, walks were taken through the grand rock scenery which has conspired with the local cheese production to make the little village famous. The wonderful stalactite cavern was visited in groups. Returning to the station, a handsome dinner awaited the tourists, spread in a large building near by. Speeches followed the dinner, and at 9 p.m. precisely the special train conveyed the whole party back to Bristol.

At the dinner :—

The chair was taken by Mr. BOORNE, who was supported by the Presidents of the Pharmaceutical Society and of the Pharmaceutical Conference, and was faced by Mr. Townsend in the vice-chair.

After proposing in loyal terms "The Queen" and "The Royal Family," toasts which commanded the usual patriotic enthusiasm, Mr. BOORNE gave "The British Pharmaceutical Conference." Some people, he said, might ask the use of such an association, but no one would question its value who had ever attended one of its meetings. It provided a great intellectual, and at the same time a great social, benefit to pharmacists. It brought us in contact with men whose names were widely known and revered. It had brought down to Bristol, for instance, the President of the Pharmaceutical Society, and representative men from Scotland, and Ireland, and all parts of the kingdom. He called upon the company to drink heartily the toast of "Prosperity to the British Pharmaceutical Conference," and he coupled with it the names of its honoured President, Mr. Groves, whose address, given two or three days ago, had been not often equalled, and of its indefatigable Secretary, Professor Attfield.

Mr. T. B. GROVES, who was received with loud cheers, said he had only quite recently learned that his presidential duties still clung to him. He was, however, most proud to respond to this toast once

again before he shuffled off this mortal, or rather immortal, coil. He was literally the slave of the Conference. What he could do for it he had done, and he hoped yet to be able to do more. If, as Mr. Boorne was pleased to say, the meetings had passed off well under his presidency, he was extremely proud as far as his share went. After commenting briefly on the benefits to be derived from these meetings, Mr. Groves concluded by heartily thanking the officers and members generally for their kind support during his presidency.

There were calls for Professor ATTFIELD, who in response said it was difficult to speak fittingly year after year to this toast, "Prosperity to the Conference." There were, however, on this occasion some special reasons for an increase of interest in the Conference. He could, for instance, congratulate those present on the fact that they had amongst them in that party representatives of all their past presidents. They had the son of their first president, the honoured and revered Henry Deane; they had the two colleagues of Professor Bentley; they had those who so admirably represented Mr. Stoddart, and in regard to Mr. Stoddart he (the speaker) would say that one of the greatest achievements of the Conference was, not the discovery, but the rediscovery of that gentleman. There had also been present with them that day the brother of the great pharmacologist, Daniel Hanbury; and besides these there were sitting amongst them Mr. Brady, Mr. Groves, and the President elect, from whom so much was expected, Professor Redwood. Other reasons for congratulation were found in the fact that during the past year they had added to their roll of membership some of the greatest names in science. Without any request from him, Professors Odling and Frankland and many others had joined the Conference. A great compliment, too, had been paid to the Conference by the President of the Chemical Section of the British Association. Mr. Vernon Harcourt, in his opening address, had urged that the Chemical Section of the British Association, and indeed all such societies, should issue lists of subjects for investigation, as was done by the British Pharmaceutical Conference. In the representative character of the present gathering, and in the recent wide recognition of the Conference by prominent men of science, there were fresh evidences of that past "prosperity" which the Chairman had asked them to recognize, and fresh guarantees of that future "prosperity" they had been asked to promote. For himself, he (Professor Attfield) thanked them for their many tokens of appreciation of his efforts in aiding to found and his continued

labours in organizing and developing the British Pharmaceutical Conference.

Mr. C. EKin said that when a member visits one of these pharmaceutical conferences for the first time he cannot fail soon to become sensible of the subtle and benign influences which pervade it. At first he is a little puzzled to account for the origin of such influences, but it becomes clearer to him when he hears a certain gentleman rise and make a more than usually weighty remark. He asks his neighbour the name of that gentleman, and learns that it is Mr. Hills. Mr. Ekin had now to propose the health of that gentleman as President of the Pharmaceutical Society, and he was sure that they could have no better representative of the kindly feeling which existed between the elder and the younger bodies.

Mr. Hills said he could reply in a double capacity. He had the honour to hold the position of President of the Pharmaceutical Society, and was also a Vice-President of the Pharmaceutical Conference. He should never be president of the latter body, but he was not second to any one in his desire to promote the interests of the Conference. At the same time he should not forget the Pharmaceutical Society. The Conference was the offspring of the Pharmaceutical Society, and as such he had always regarded it. Mr. Hills remarked on the highly successful manner in which everything had been managed by the Bristol pharmacists, and he thanked them most heartily.

Mr. TOWNSEND proposed "The North British Branch of the Pharmaceutical Society," coupled with the health of Mr. Mackay. He often spent his holidays in Scotland, and wondered how people could ever get ill there, and thus need any pharmacists at all. He could understand their being ill in Bristol or in London. He supposed the North British chemists existed for the benefit of their fellow-creatures in a general sort of way.

Mr. MACKAY said the natural modesty peculiar to his nation was more than usually tried on this occasion, when surrounded by so much grace and beauty and by gentlemen of such eminence in science and literature. He had heard of organic and inorganic chemistry. Mr. Stoddart had told them something of the inorganic chemistry of the hills and rocks around Bristol, in which he had discovered some traces of the precious metals. Mr. Mackay was reminded of the attempt made some 100 years ago by a party of Dutch speculators to cart away from Edinburgh the noble Calton Hill. Chemistry was in its infancy then, but notwithstanding the wise men who governed Edinburgh at that time concluded

that Calton Hill contained some gold, and it was due to that belief that it was retained in the city. Now to turn to organic chemistry. Of all the chemical organization he had ever seen or heard of, he had never seen nor heard of such organizations as that which Bristol had shown them. He might mention particularly Mr. Boorne, Mr. Schacht, and especially and emphatically Mr. Pitman. In the name of the Scotch deputation and for himself he begged to thank those gentlemen for their labours with more sincerity and with more cordiality than words could convey.

Mr. CARTEIGHE had to propose "Success to Provincial Pharmaceutical Associations." Such a toast, he thought, was particularly appropriate in a city like Bristol, where were men fully qualified as scientific chemists, geologists, and biologists, yet actually practising the profession of pharmacy. Bristol had done enough to make other large towns in the kingdom which had not a pharmaceutical association ashamed of themselves. The toast was coupled with the name of Mr. Shaw, of Liverpool.

Mr. SHAW gave brief notes of his experience in connection with the Pharmaceutical Associations of Edinburgh and Liverpool. In respect to the latter society, Mr. Shaw said it was established in 1848, and was yet in existence. They had lost some of their able men, however, such as Edwards, Evans, Mercer, and others. Their great difficulty was to get the young men to come and take advantage of what was provided. It had been suggested that they should apply to Bristol to know how they managed to carry on their classes, but his reply had been that Bristol had such men as Schacht and Stoddart.

Mr. YOUNG (Edinburgh) proposed "Science and Literature," and having alluded to the advantages derived from science generally, he coupled the toast with the name of Mr. Brady.

Mr. BRADY said he was the victim of a cruel blunder. He had been wondering what was his connection with literature, but his friend, Mr. Walter Hills, had suggested that it might be traced to the publication of "Tate and Brady's Hymns." If that were so, he ventured to think that the proper person to reply to the toast would have been the senior partner in the concern, who sat at the top of the table (Mr. Tait, of Edinburgh).

Mr. SCHACHT proposed "The Health of Professor Redwood, the President Elect." He had had the great luck of being one of the earliest students of the Professor's, and ever since he had had the honour of being his friend.

Professor REDWOOD was very pleased to take this earliest oppor-

tunity of thanking the members of the British Pharmaceutical Conference for the high honour they had conferred upon him. He regarded the distinction as a very high one, and the spirit in which it had been conferred was something more than kindness. Although wholly unworthy, he could not hesitate to accept the post. He had come among them this year as an apprentice. He had associated with members at Bristol more than he had done on any previous occasion, and it gave him very great pleasure to propose "The Health of the Local Committee," naming especially Messrs. Boorne, Townsend, Schacht, and Pitman.

This toast was received with tumultuous applause, and loud calls were made for Mr. Pitman. That gentleman said he should have been prepared to take his part in the quartette, but he had not expected to be called for in that manner. He was, however, happy if he had been in any way instrumental in promoting the pleasure of the visitors. Certainly he had been repaid a thousand-fold by the friendships he had formed, and he should be very glad if the meeting of the British Pharmaceutical Conference was an annual affair for Bristol.

Mr. TAIT (Edinburgh) proposed "The Ladies," to which Mr. WALTER HILLS responded.

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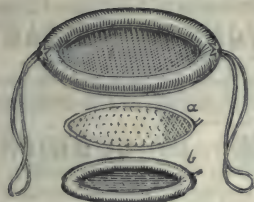
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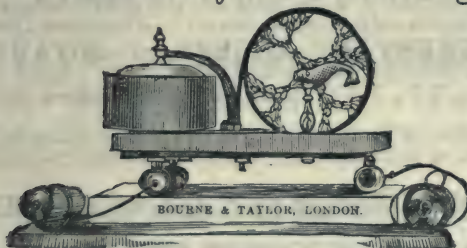
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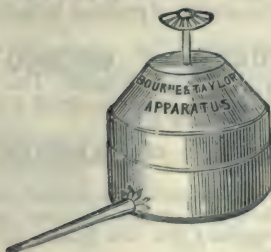
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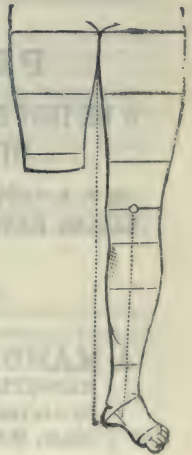
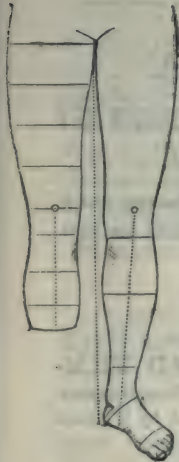
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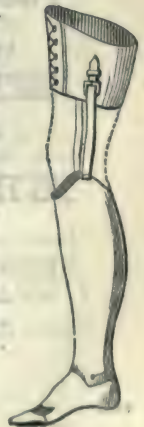
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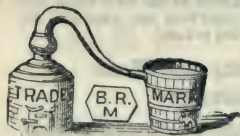
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IMPORTANT CAUTIONS

From Lord Chancellor SELBORNE,
Vice-Chancellor Sir W. PAGE WOOD, and the
Lords Justices of Appeal.

VICE-CHANCELLOR SIR W. PAGE WOOD, by whom the suit in Chancery was first heard, stated in his judgment that "Dr. J. Collis Browne was undoubtedly the Inventor of Chlorodyne, that the whole story of the defendant Freeman was as deliberately untrue as the falsehood he had deposed to with reference to the use of his Chlorodyne in the hospital."

THE VICE-CHANCELLOR also stated "that Chlorodyne was a fanciful name, and had application been made sooner, the Court would have given Dr. Browne protection."

LORD CHANCELLOR SELBORNE coincided with the judgment of the Vice-Chancellor upon this point, and stated "that had application been made at a proper time and place, the Court would have found means to restrain the Defendant from misrepresenting the decision of the Vice-Chancellor."

LORD JUSTICE JAMES, on appeal, stated in his judgment, "that the Defendant Freeman had made a deliberate misrepresentation of the decision of Vice-Chancellor Wood."

It was proved in court, on affidavit by Mrs. Forbes, of Paris, that the testimonial published in the "Times," November 14th, 1865, speaking of the great efficacy of Chlorodyne in Cholera, referred to Dr. J. Collis Browne's Chlorodyne, and that she never used any other, that she had written to the Defendant Freeman to that effect; notwithstanding which notice the Defendant publishes the said testimonial as referring to his medicine.

The Editor of the "Medical Times and Gazette," in his report on Chlorodyne, January 13th, 1866, gives information that the Chlorodyne referred to was the medicine introduced by a retired Army Medical Officer, which was Dr. J. Collis Browne. Still this is published by the Defendant as testimony to his medicine.

Numerous affidavits from eminent Physicians and others were produced in Court, stating that Dr. J. Collis Browne was the inventor of Chlorodyne, and that when prescribing they mean no other.

The Defendant himself publishes that his compound is in effect and composition quite different to any other preparation; nevertheless he assumes the name, testimonials, etc., of Chlorodyne.

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*Extract from "Pharmaceutical Journal" of May 1, 1856,
page 486.*

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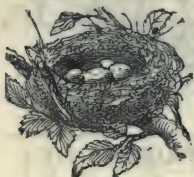
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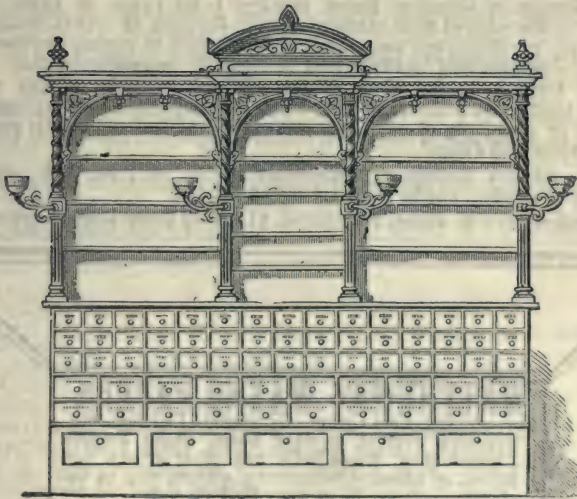
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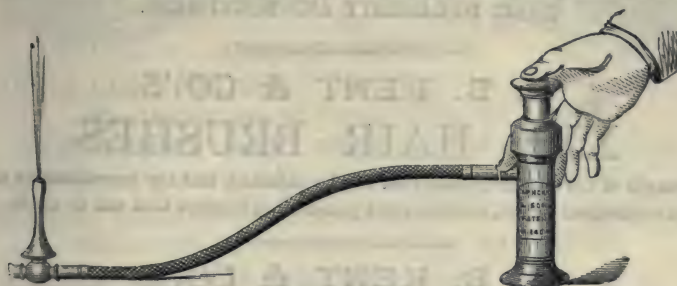
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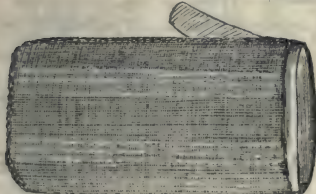
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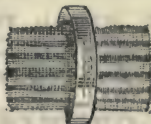
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Do. " 2 ...	9/-	Black	15/-	Do. " 2	12/6
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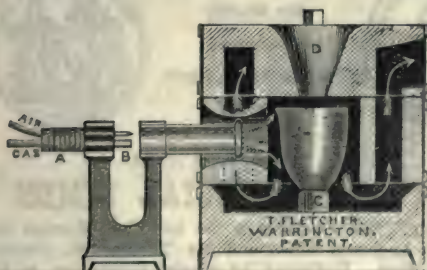
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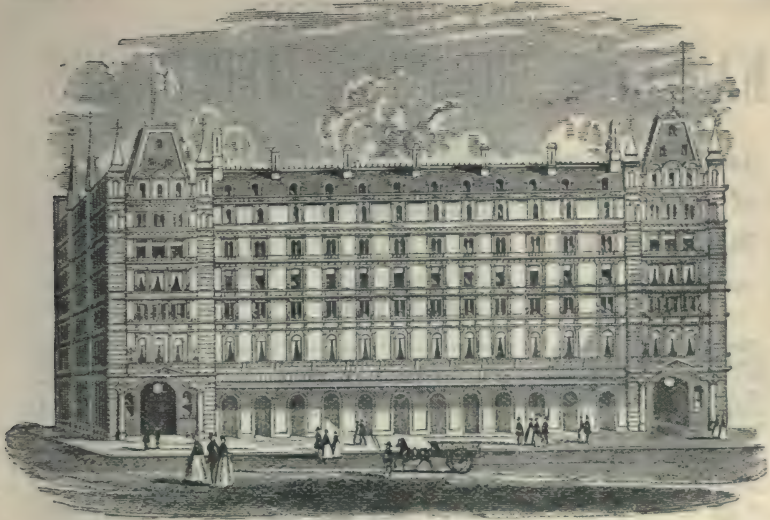
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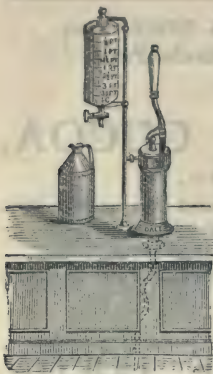
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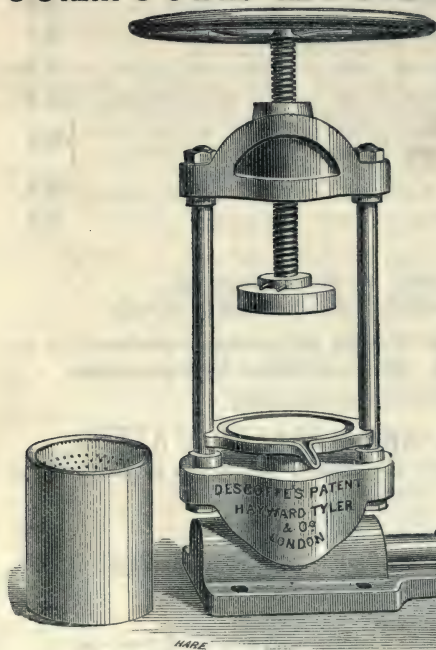
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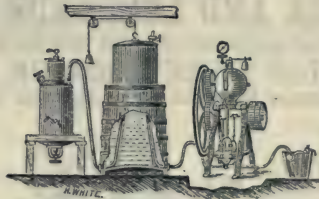


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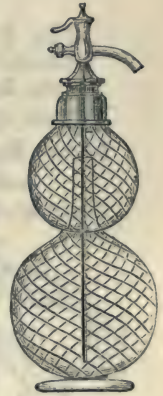
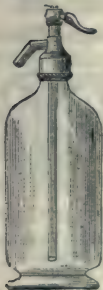


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		Per Dozen.		Per Orig. Pkg.	
		Qts.	Pts.	Qts.	Pts.
Adelheidsquelle	Iodized	12/
Aix-la-Chapelle	Sulphurous	18/	12/	72/	48/
*Apollinaris	Acidulated, Gaseous ..	6/6	5/3	24/	*38/
Do. (Stone)	Do.	6/6	5/3	22/	17/6
Bareges	Sulphurous	12/	9/	48/	36/
Birmenstorf	Alkaline	12/	...	48/	...
Bonnes	Sulphurous	13/	9/	53/	37/6
Bourboule, La	Saline	12/	...	48/	...
Bussang	Alkaline	7/	...	28/	...
Carlsbad	Do. & Purgative	10/	...	40/	...
Condillac	Do.	6/	...	25/	...
Contrexeville	Do.	10/	...	40/	...
Ems	Do.	8/	...	30/	...
Engbrien	Sulphurous	10/	...	40/	...
Echingen	Acidulated, Gaseous ..	6/	4/	23/	16/
*Friedrichshall	Saline, Aperient	11/	7/6	*26/	*35/
*Giesshubler	Alkaline, Ferruginous ..	11/	8/	*21/	32/
*Harrogate	Sulphurous	7/	...	*20/	...
Homburg	Saline, Gaseous	10/	8/	40/	32/
*Hunyadi-Janos	Do. Aperient	12/	8/6	*25/	34/
Kissingen	Alkaline, Gaseous	11/6	8/6	46/	34/
Krankenheil	Iodized	14/	...	54/	...
*Kreuznach	Do.	10/	...	*24/	...
Lardy	Ferruginous	9/	...	35/	...
Marienbad	Alkaline, Purgative ..	13/6	10/	54/	40/
*Missisquoi	No Analysis given ..	25/	...	*50/	...
*Orezza	Ferruginous	12/	...	*28/	...
Plombieres	Alkaline	9/	...	36/	...
Pougues	Do.	9/	...	36/	...
*Pullna	Saline, Purgative	12/	8/6	*36/	*25/
Pyrmont	Ferruginous	14/	...	52/	...
Renaion	Acidulated, Gaseous ..	6/	...	23/	...
Rosdorf	Do. do.	6/	...	23/	...
Saidschutz	Saline, Purgative	11/	...	42/	...
Saint Galmier	Acidulated, Gaseous ..	6/	...	24/	...
Saint Moritz	Ferruginous	13/	...	52/	...
Saratoga	Alkaline, Gaseous .....	...	12/	...	47/
Schwalbach	Ferruginous	8/	6/	30/	23/
Schwalheim	Acidulated, Gaseous ..	9/	...	35/	...
Seltzer	Do. do.	6/	4/	22/	15/6
Soultzmatt	Do. do.	7/	...	28/	...
Spa	Ferruginous	10/	...	40/	...
Vals	Alkaline, Gaseous, &c.	9/	...	33/	...
Vichy	Do. do.	9/	8/	33/6	28/6
Do. Saint Yorre	Do. do.	8/6	...	32/	...
Weilbach	Sulphurous	10/	...	40/	...
Wildungen	Alkaline	11/	...	43/	...

* Original Packages of Apollinaris, Glass pints contain 100. Friedrichshall, 30 qts. or 60 pts.; Giesshubler, 25 qts. or 50 pts.; Harrogate, 36 qts.; Hunyadi-Janos, 25 qts. or 50 pts.; Kreuznach, 30 qts.; Missisquoi, 24 qts.; Orezza, 30 qts.; Pullna, 40 qts. or 40 pts. With these exceptions all Original Packages contain each 50 quarts or pints.

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Price List and Terms on application.

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